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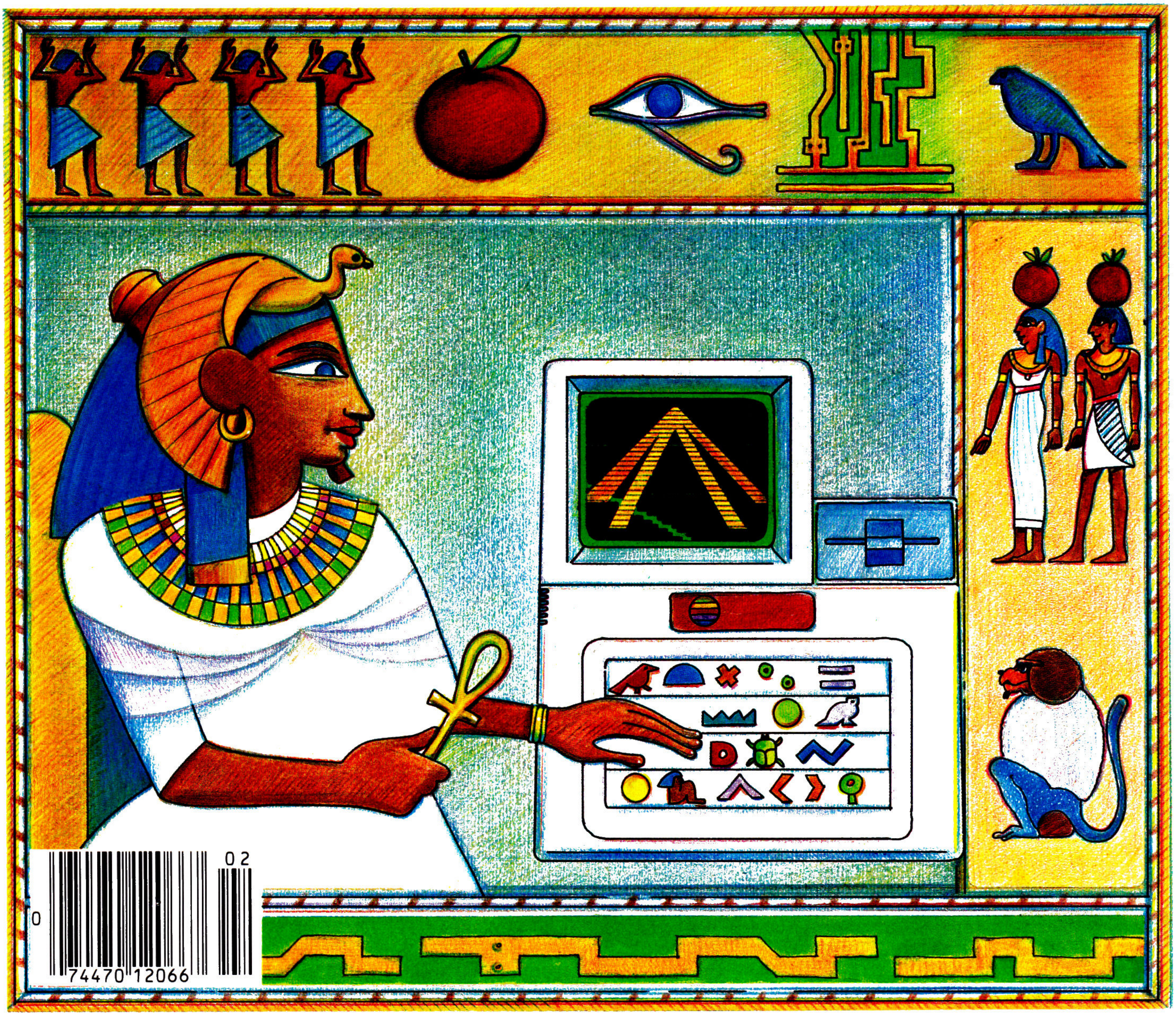

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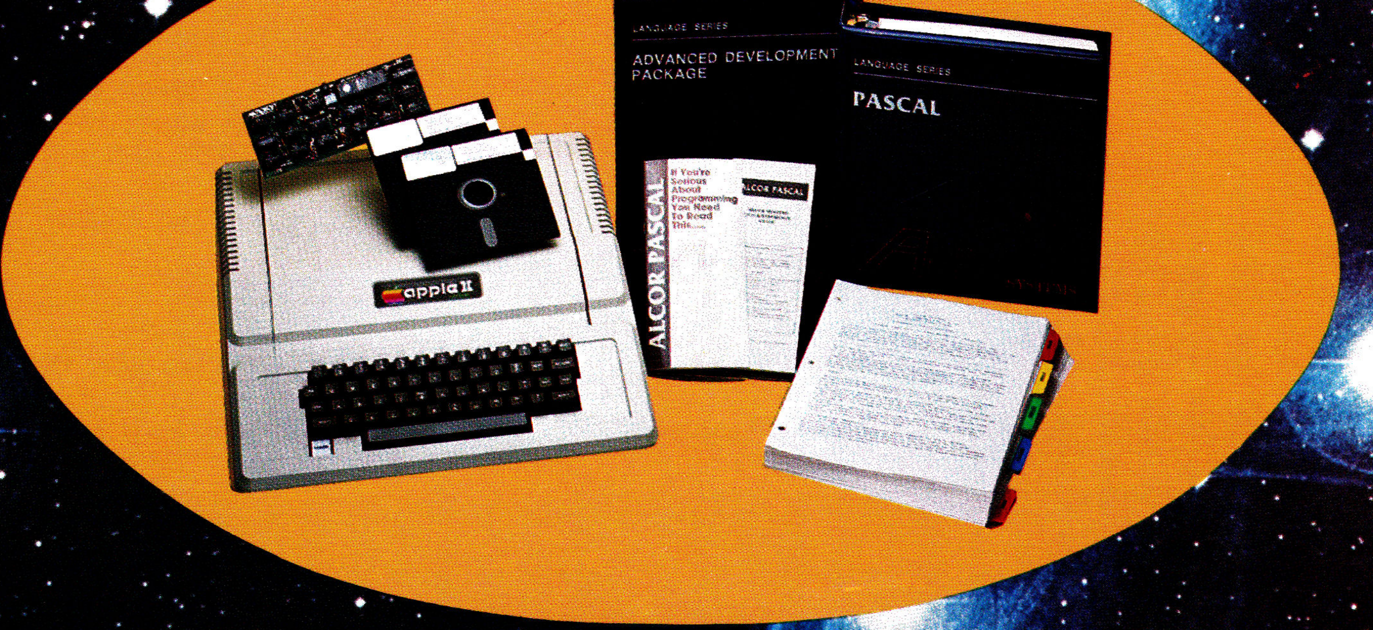

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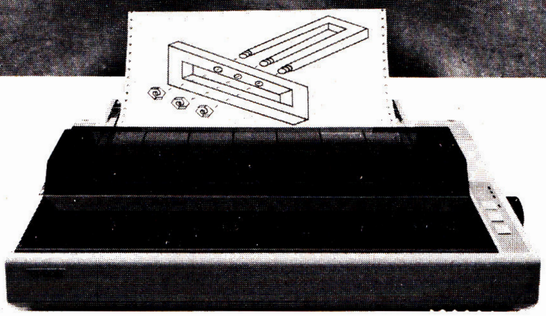
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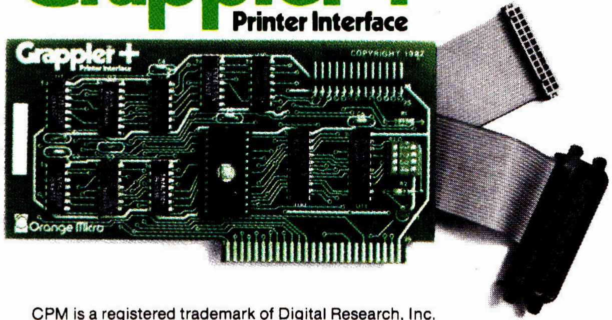

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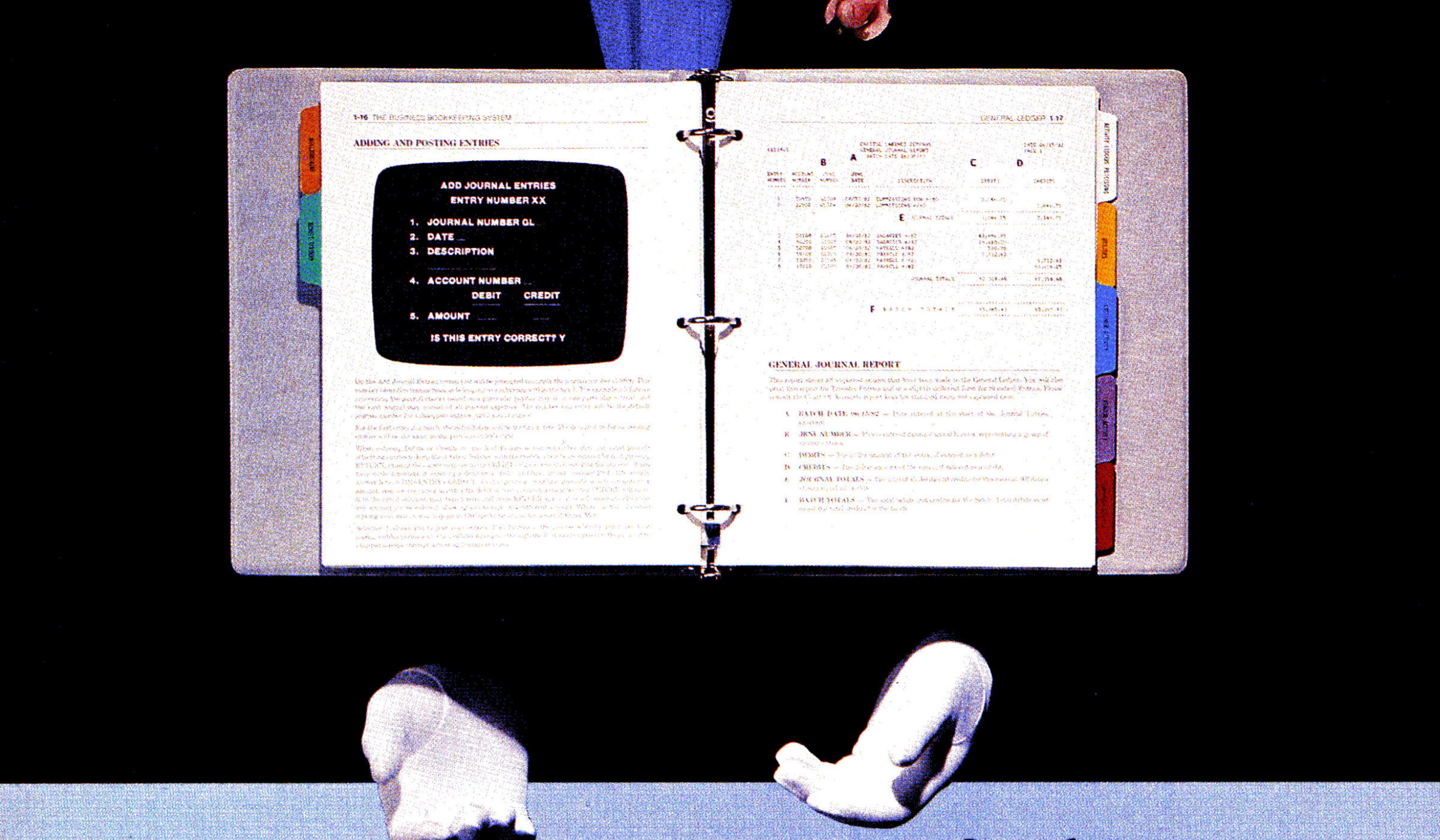

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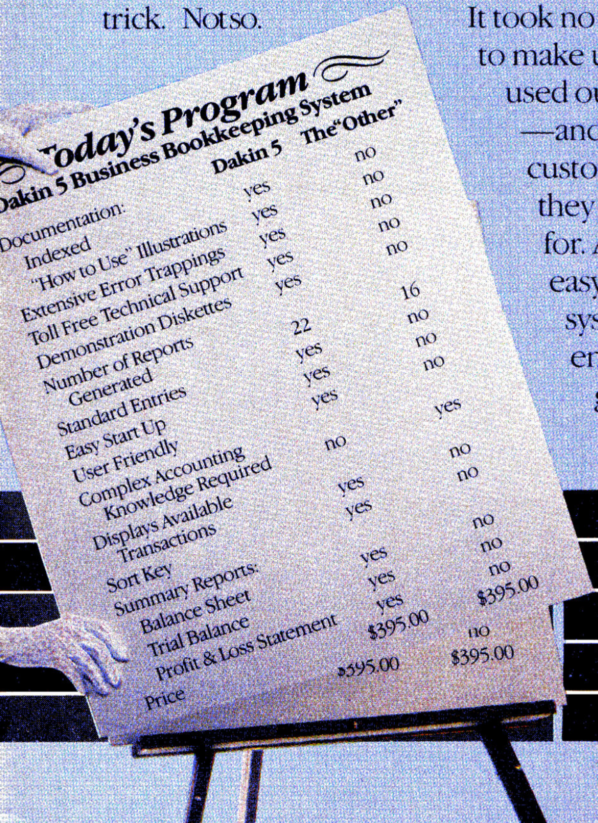

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Vol. 1 No. 2

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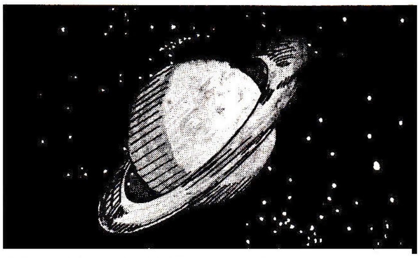

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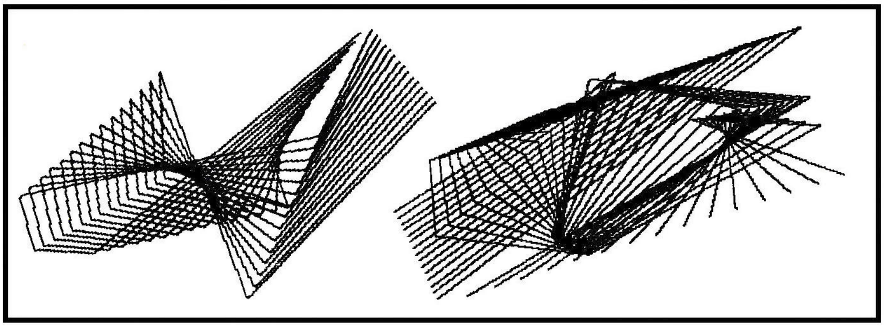

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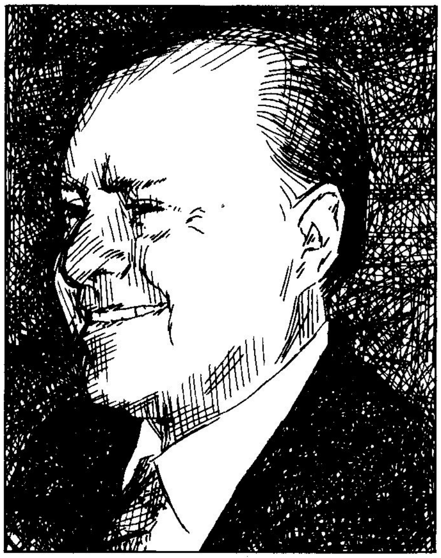
Hot Cider

Remarks from the Publisher...

Wayne Green



The publisher of inCider, *Wayne Green, spent a number of weeks recently in the Orient, investigating the status of microcomputing in that part of the world. While on his way, he transmitted this editorial to the magazine.*

One of the reasons there are so many con men in the world is because so many people go bananas when they think they can beat the system and save a few bucks. Well, my friends, there are a whole bunch of wily Chinese gents just rubbing their hands together in contemplation of the almost inexhaustible supply of suckers in the U.S. who are willing to send money to Taiwan for a discount Apple.

After having personally looked at about thirty of the over one hundred rip-offs of the Apple being made in Taiwan, and after having talked with quite a few of the chaps who make these Chinese copies, I have some advice for you. If you send for one of these things you are not just a sucker, you're crazy.

Taiwan, which is accepted as a country by the U.S. and the island of Nauru and not much else, has a government that ignores copyrights and trade marks. You can buy locally printed copies of most of the computer books for a couple of bucks each. Software? Copies of VisiCalc are going for under $10. Cartier watches? You can get a nice Chinese copy of a $14,000 watch for about $30. . . and I defy you to tell the difference. It's legal on Taiwan! And so is making copies of the Apple and exporting them. The rub comes when U.S. customs spots them arriving . . . and confiscates them.

One would think that a prudent manufacturer would at least change the box and make it a little more difficult to detect the Apples arriving at U.S. shores, but, on the contrary, many of these chaps have gone to the trouble of imitating the Apple logo and copying the Apple instruction manuals. I saw little effort made to vary in any way from the Apple design. Of course, a look inside is something else. Most of them are very poorly made, with many of the plated-through holes not plated through. And I gather there is a widespread use of surplus memory chips from the game manufacturers. Several sources said only about 70% of the computers work when you get them. . . lending still a further Russian Roulette aspect to their purchase. The reliability for most of them is poor, as you would expect. In all, it is not a great gamble.

When you remember Taiwan is a third world country that, despite recently developed manufacturing industry, has virtually no electronic engineers or technicians, perhaps you can understand why they are able to copy American and Japanese products, but are at a loss to make even the simplest of changes. Taiwan has had a government policy for years of discouraging youngsters from electronic hobbies. The island is, in many ways, a dictatorship, with personal freedoms elusive. I'm sure that most of you have read about the murder of the dissident who returned from a visit to America. Chinese students in America have been complaining of the Chinese secret police keeping close tabs on them here. Well, at home they are not permitted to own short wave radios, so the usual teenage opening to electronics via amateur radio is not possible.

No country that does not offer electronic hobbies for its teenagers is able to generate much in the way of engineers, technicians and scientists. To be good at this craft calls for starting young. . . preferably at 12 to 15 years of age. Later starters seem to seldom have the enthusiasm and personal interest of the dedicated teenager. Well, with but one licensed radio amateur in all of Taiwan, and with radio of almost any kind off limits to kids, it is not surprising that there are so few technicians. If Taiwan is going to seriously compete in the electronics field the country is going to have to make some big changes.

I recently attended the third electronics show I've seen in Taiwan. It was most disappointing. The products were almost entirely rip-offs of Japanese products such as the Sony Walkman. The quality was disap-

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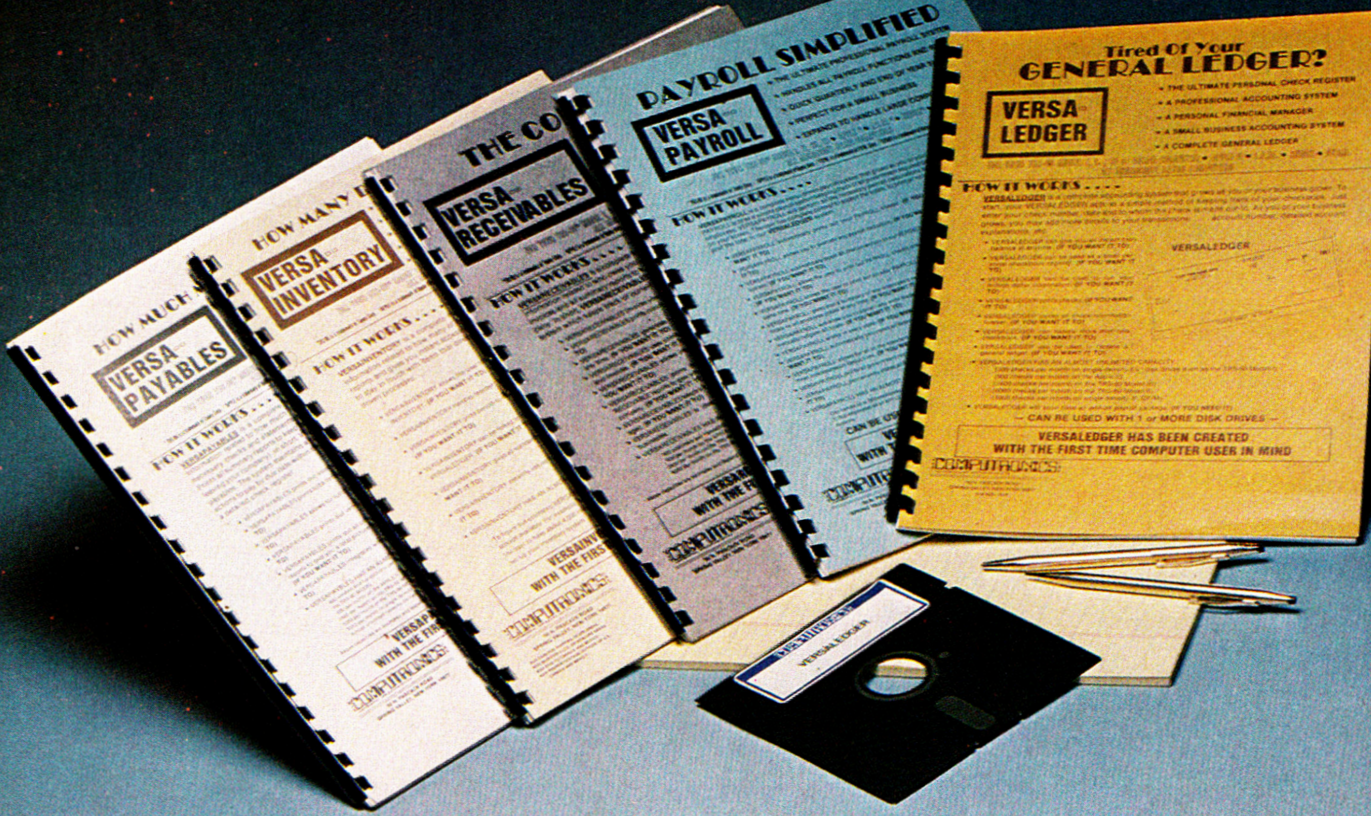

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Wayne Green
EXECUTIVE VICE PRESIDENT
Sherry Smythe
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Debra Wetherbee
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Matt Smith
ASSISTANT PUBLISHER
Jeff DeTray
CORPORATE CONTROLLER
Roger Murphy
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603-924-9471
Patricia Ferrante
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ADVERTISING, 603-924-7138
David Schissler, Manager;
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John A. Garland, Frank Surace,
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Sara Bedell, Manager; Marie Barker, Melody Bedell, Michele DesRochers, Jennifer Fay, Lynn Haines, Linda Locke, Nancy Newman, Debbie Nutting, Karen Stewart, Susan Weller
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pointing. There was only one sign of originality. . . an Apple-compatible computer called the Micro-Professor. We'll have more for you about this system when a sample arrives for us to check out. Other than that, the computers were all Apple copies.

I understand that there is a good possibility that Taiwan may soon move to encourage amateur radio and thus try to attract teenagers. This, plus the introduction of microcomputers into their schools could turn around the problems Taiwan is having.

As I wandered through the hundred or more exhibits at the Taipei Consumer Electronics Show, I wondered where the myriad of copies of Walkman cassette players are being sold. I wondered at the dozens of makers of pens with watches in them. When I talked with some of these manufacturers I found out more about it. The fact is they're having a hard time selling these rip-offs. The world is wising up to the Taiwanese quality and lack of creativity, and this has been hurting sales.

In the Apple rip-off field there are over a hundred firms, yet most of them are relatively small. . . some with only two or three people turning out a few Apples a week. Not all are copying the Apple logo. Some are using other names such as the Banana, the Lemon, the Tangerine, and so on. But they're all in Apple-type cabinets, so no one is fooled. The pity of it is that the Chinese are very hard workers. . . they just lack the education needed to create new electronic products. Education denied them by their government, so to speak.

In Japan, where just about every teenager is exposed to both amateur radio and computers, and where they have over 900,000 licensed radio amateurs, creativity and enthusiasm for electronics is the best in the world. It is going to take some doing for Taiwan to catch up with this lead. . . if they ever can.■

"The pity of it is that the Chinese are very hard workers. . . they just lack the education needed to create new electronic products."

Letters

inCider *feels that one of its most important roles is to provide a forum for readers. We welcome letters for publication with comments on articles, embellishments to programs, appeals for information—whatever you feel moved to write. Address your correspondence to Letters to the Editor,* **inCider**, ***Pine St., Peterborough, NH 03458.***

At this writing our first issue has just hit the stands. We are fortunate, therefore, to already have one Letter to the Editor. Can anyone help?

—the editors

Dear *inCider*,

Can you direct me to a source of information on how to prepare a disk on my Apple II so it cannot be copied? I have written to the Apple Computer people, but they don't respond. I have also asked the dealer where I bought the computer, but they seem to know less about the equipment than I do.

William Volk
44 Wheatsheaf Lane
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Pine Street
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Linda Stephenson

ASSISTANT EDITOR
Peg LePage

NEWS EDITOR
John P. Mello, Jr.

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February is Fantastic!

A brand new graphics column makes a grand entrance, and an inside look at CP/M PLUS is a must if you're considering CP/M. Much more to follow...

Fudge It! Not what you're thinking. Only the commencement of our graphics column by that rascal Don Fudge of Avant-Garde Creations. This month's installment covers vector shape tables—and shows you how to *easily* manage them. The mysteries of Apple graphics need not be as confusing as you thought!

Dan Bishop's Applesoft Adviser continues the instruction regarding Applesoft variables, and Peggy Burnett's data tutorial marches forward briskly. Reviews? Plenty. Everything from the UCSD p-System and Sensible Speller to some very popular games. Also, "Keyboard Graphics" proves that graphics capabilities on the Apple need not be complex. For the literati, an epistemological play leaves you waiting.

Business more your bent? Two business programs, one dealing with graphics applications, the other with pressure, are found inside *inCider*. Pascal programmers are bound to find Screen Shepherd helpful in their own programs—David Kutzler shows you how to control the elusive cursor on your screen. And John Stephenson's "Pascal Primer" will whet your appetite for more.

If you can't live without some form of hardware modification to busy your fingers, you'll find the first part of an EPROM programmer in this issue, as well as a printer interface for the Epson II.

Apple III owners and users can find the second installment of Bill O'Brien's entertaining column, III's Company. The reprobate Paul Raymer comes alive with twin programs in OutCider, and has also managed to capture the guest editorial spot with an exposé of computer advertising. Apple graphics are also tackled in still another tutorial entitled "Higher Resolution Apple Graphics." San Francisco's Applefest is reviewed, and *inCider*'s Hints 'N' Techniques department returns with, of all things, a way to downgrade your Apple!

String art finds its way into the Graphics Goodies department, and Wayne reveals a little more about himself. A rather full and outstanding selection of useful material. And if you think this issue is good, just wait until March!

—the editors

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Circle 27 on Reader Service card.

Fermentations

As a salute to you, our readers, inCider would like to publish your thoughts on issues confronting the computer industry. This month our guest editor, Paul Raymer, has some definite ideas regarding the advertisements that grace the pages of today's computer publications.

Each day I anxiously anticipate the mail delivery, hoping to receive one of my many computer magazines so I can get the newest scoop on exciting developments in the world of personal computers. I thoroughly read each magazine page by page, diligently study each article, read every column, jot down every helpful hint, and study in great detail the exciting full page and full color ads from the various computer manufacturers.

Aside from trying to understand binary files, machine language and magazine label subscription codes, my biggest problem with these publications is relating to the ads.

It may be that as a computer owner I take a different attitude than, say, a prospective owner, because mostly I *use* my computer. Now. Every day. For every possible use. When I look at many of the ads I find it difficult to imagine *that* computer in *my* environment.

Let's look at some of the ads compared to the computer life I lead!

The first (Figure 1) is headlined "Take Stock In Your Future" and shows this guy with a pipe and a dog watching text scroll on his 17-inch (43.18-cm) color TV as two sets of graphs squiggle about. Just the *thought* of ashes on my keyboard makes me cringe! The dog obviously has no interest in the computer or the stock market, since he/she is not watching the screen but rather eyeing the candy in the nearby dish. My dog plops on the floor and moves only when an excessive number of ?SYNTAX ERRORS makes the bell on my computer ring too often.

And just look at the computer—no hands on it and no paper or pencil—doing its merry thing with light only from the 60-Watt (855-lumen) table lamp about eight feet (2.4384 meters) away. This manufacturer certainly makes a strong point that their computer *can* do more than just play games.

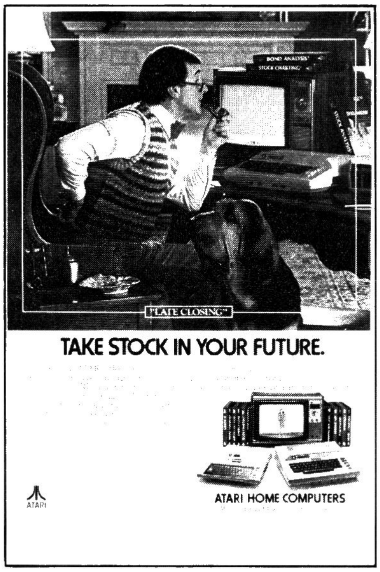


Figure 1.

Figure 2.

The next ad (Figure 2) is fun. After all, who doesn't like this happy TV star? The computer is really neat because it (like so many others) has no wires to hook up and get in your way. Instant keyboard, color monitor and peripheral expansion system. And—it's easy to expand. But, apparently, not on the little teeny table supporting the three components. There isn't even room for a writing pad, a couple of disks or any reference material.

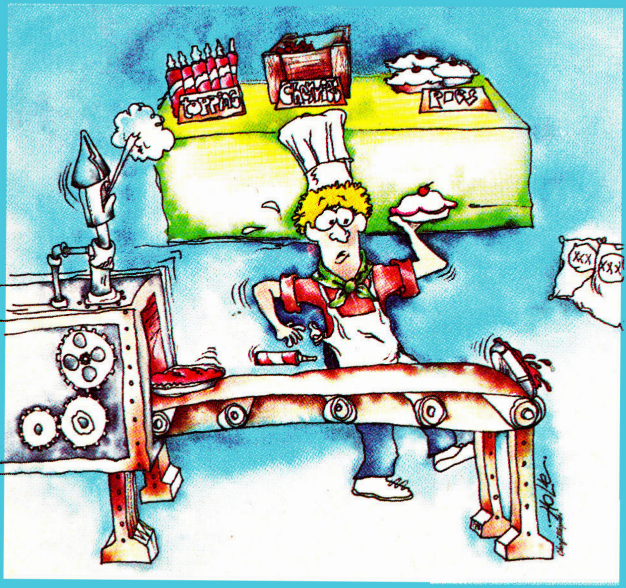
My computer doesn't live in such a nice environment. All my stuff is stacked on top of everything else and all of it is piled on a 6-foot by 30-inch (1.8288-meter by 76.2 cm) table. That gives me room for my 10 mini-boxes of disks for quick reference, my tray of utility disks, four or five unclassified mystery disks lying about and sheets of notes, papers, clippings, folded magazines and two kinds of graph paper. Then, luckier than most I suppose, I have a printer that sets on the far end of my desk, available as whim dictates. And wires—I have wires coming and going in and out of more slots, holes, devices and things anyone (except those folks in Texas) could dream of.

Then I read the next ad (Figure 3) and notice it features the Logo program for teeny kids to use with a Color Computer. It shows these two adorable youngsters both using the computer at the same time, the little girl watching the screen and the little boy watching the little girl. Wow! And you thought sex only sold cigarettes, beer and financial programs! The kids are nonchalantly pressing

SPY'S DEMISE

Arcade Action by Alan Zeldin

Somewhere on each floor of the Soviet diplomatic mission in Pyongyang are the nine parts of an encoded message. Your future is assured if you can just find those pieces and put them together, and then solve the puzzle. But to do so you must avoid the embassy guards who make frequent rounds at unscheduled intervals. They don't ask questions first, either.



PIE-MAN™

by Eagle Berns and Michael Kosaka

You got a late start looking for that summer job, and all you could find was a baker apprentice position at the Automated Bakery Company. Simple enough, since the pies are made by machine . . . all you have to do is add topping and put the pies away when they come out on the conveyor belt. Shouldn't be too difficult of a summer, you think to yourself . . .

TRANSYLVANIA

A High Resolution Graphic Adventure

Crafted by Antonio Antiochia

Transport yourself to the dark forests of Transylvania, where mystery lurks behind every towering tree, and venture to rescue a damsel in distress. Transylvania uses over one hundred colors and the finest graphics ever seen in a high resolution adventure to present a true challenge and hours of enjoyment to all adventurers.

Above games now available for the Apple computer. Arcade games work with keyboard, joystick, or Atari joystick. Graphics for all above created with the aid of The Graphics Magician.

penguin software the graphics people

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Circle 23 on Reader Service card.

Apple is a trademark of Apple Computer, Inc. Atari is a trademark of Warner Communications, Inc.

Radio Shack's new Color LOGO helps them use the most powerful processors in the world . . .

. . . their own minds.

Our remarkable new Color LOGO programming language and a TRS-80® Color Computer will enable children to make a myriad of discoveries. Color LOGO will pique curiosity and excite young minds. Students will welcome each new challenge. And to welcome the challenge is the secret of learning.

A Language for Learning. The Color LOGO language is designed to help students grasp graphic relationships. It's easy to learn and fun to use. Through manipulation of "turtle" graphics, students learn to program. The benefits? The computer becomes a friendly learning tool, and students gain valuable insight into advanced concepts.

Something for Everyone. Children who haven't yet begun to read can use a "doodle" mode to create their own graphics. And a "hatch" command creates multiple turtles, capable of running separate programs simultaneously — a fascinating programming concept for students of all ages.

Low Cost Makes It Ideal for Classroom Use. Similar programming languages are expensive to implement because they require very large amounts of memory. But not Radio Shack Color LOGO. Our disk version is just $99. It requires only the $649.95 32K Extended BASIC Color Computer and a $599 Color Disk Drive. And we have a Program Pak™ (ROM) version that's soon to be available. It will require only our $399.95 16K Color Computer. Use your own color TV with either version. Both include an excellent instruction manual with lessons and programs for both the beginner and advanced user.

Discover the World of Color LOGO. Stop in today at a Radio Shack Computer Center, store or participating dealer near you.

For the name of the full-time educational coordinator in your area, call Radio Shack's Education Division at 800-433-5682 toll-free. In Texas, call 800-772-8538.

Radio Shack
The biggest name in little computers™
A DIVISION OF TANDY CORPORATION
Retail prices may vary at individual stores and dealers.
CIRCLE 254 ON READER SERVICE CARD

Figure 3.

keys, producing a multi-color high-resolution symmetrical illustration. . . and all by memory (or pure chance), since no instruction book, no teacher or parent, no notes, no disk or cassette interfacing is apparent. It is truly inspiring!

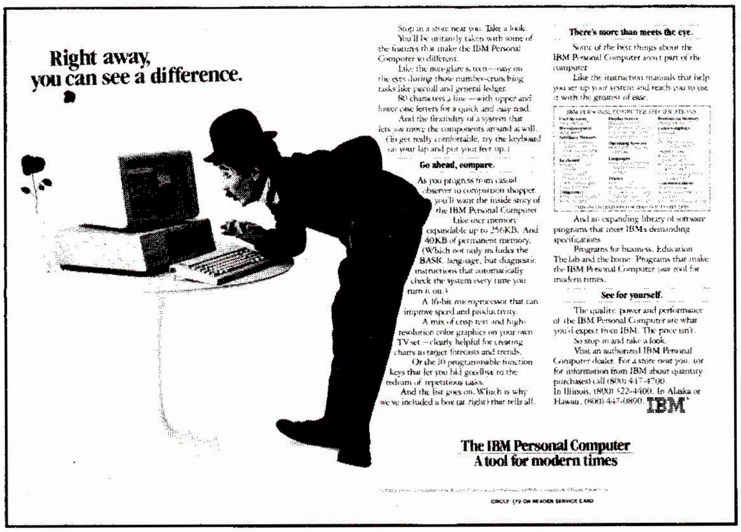
I have trouble with Basic, so surely Logo would be too tough for me. Since my wife thinks my computer is kind of dumb anyhow, and she certainly wouldn't let girls play games with me, and I have trouble understanding Paul Lutus' instructions for "Electric Duet" and Mark Pelczarski's booklet on the "The Graphics Magician" (although I have learned how to spell Mark's name), what chance would I have with Logo? But then, my computer has things hooked up to it, like two disk drives, a tape recorder, a cooling fan, two paddles (optional) and a joystick.

The last ad (Figure 4) is a dandy. The headline reads "Right away, you can see a difference," and you certainly can. This girl dressed in a bum's suit is amazed by the flashing monitor screen. No wonder. Another computer with no electrical cords. And this one is working. The flower makes a really neat touch, but I have the feeling there is no water in the vase.

At my computer I have too much trouble with klutzy typing to use gloves. And as many sympathetic computer users out there will understand, using a computer while standing is little short of impossible. I have enough trouble with strange little things that creep into my programs (I understand some folks call them bugs) that I'm not at home near a computer without a book, a pad, a pinup calendar (well, that may not be necessary), a programmer's guide. . . and a chair.

Next time, I'd like to tell you how I feel about many of the "powerful" programs I see advertised in the same magazines.

Contributed by **Paul Raymer**
Las Vegas, NV



Right away, you can see a difference.

Stop in a store near you. Take a look.

You'll be instantly taken with some of the features that make the IBM Personal Computer so different.

Like the non-glare screen — easy on the eyes during those number-crunching tasks like payroll and general ledger.

80 characters a line — with upper and lower case letters for a quick and easy read.

And the flexibility of a system that lets you move the components around at will. (To get really comfortable, try the keyboard on your lap and put your feet up.)

Go ahead, compare.

As you progress from casual observer to comparison shopper, you'll want the inside story of the IBM Personal Computer.

Like user memory expandable up to 256KB. And 40KB of permanent memory. (Which not only includes the BASIC language, but diagnostic instructions that automatically check the system every time you turn it on.)

A 16-bit microprocessor that can improve speed and productivity.

A mix of crisp text and high-resolution color graphics on your own TV set — clearly helpful for creating charts to target forecasts and trends.

Or the 10 programmable function keys that let you bid goodbye to the tedium of repetitious tasks.

And the list goes on. Which is why we've included a box (at right) that tells all.

There's more than meets the eye.

Some of the best things about the IBM Personal Computer aren't part of the computer.

Like the instruction manuals that help you set up your system and teach you to use it with the greatest of ease.

And an expanding library of software programs that meet IBM's demanding specifications.

Programs for business. Education. The lab and the home. Programs that make the IBM Personal Computer your tool for modern times.

See for yourself.

The quality, power and performance of the IBM Personal Computer are what you'd expect from IBM. The price isn't.

So stop in and take a look.

Visit an authorized IBM Personal Computer dealer. For a store near you, (or for information from IBM about quantity purchases) call (800) 447-4700. In Illinois, (800) 322-4400. In Alaska or Hawaii, (800) 447-0890.

IBM

The IBM Personal Computer
A tool for modern times

CIRCLE 179 ON READER SERVICE CARD

Figure 4.

SINGLES' NIGHT AT MOLLY'S

By Norman J. Wazaney Jr.

OUR SOFTWARE IS UNPROTECTED PERMITTING CONVENIENT BACK-UP.

You never dreamed Solitaire could be so fascinating.

Solitaire in a saloon can be fun but it's better on your Apple*. Fair warning: if you get hooked on Solitaire, beware of this game! "Singles' Night at Molly's" is actually two basic solitaire card games with several variations permitting you to use the skill level and strategy you enjoy most. Play alone or against other players, where a rating system declares the winner. Features High Resolution color graphics, full user documentation and various scoring potentials.

There are hours, days, even years of pleasure to be derived from this intriguing game. Available now for only $29.95 at computer stores.

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Soft Images, 200 Route 17, Mahwah, NJ 07430.

"Singles' Night" runs on 48K Apple II, Applesoft in ROM.
3.3 DOS/One Disk Drive

Circle 210 on Reader Service card.

Soft images
DIVISION OF DECISION SYSTEMS INC

Applewatch

edited by John P. Mello, Jr.

Apples, Others, Target of TRW Center

Repair of personal micros by TRW raises eyebrows in some circles.

A move by TRW to charge into the free-lance repair of personal computers was questioned by some major computer manufacturers.

The firm's Fairfield, NJ, Customer Service Division opened a personal computer service center in Dallas, TX, last October and its sights are set on opening more next year.

"We're taking the hassle out of personal computer repair for the individual consumer," he observed. "The speed and efficiency of service this center will provide are going to set standards for the industry."

The center will service most major brands of computer-related equipment including video games and Apples.

For firms, like Apple, requiring their dealers to provide service, TRW could offer an alternative service channel. A number of dealers and distributors have approached TRW, Marketing Communications Manager David F. Gill claimed, and said the service center approach was a "great idea." He added, "They'd rather concentrate on selling and let us service it."

But Apple Computer doesn't see it that way.

"I can't really see us letting the dealers off the hook as far as taking care of service and support responsibilities," said Dick Baumann, Apple's service/support marketing manager.

"It's a company philosophy that we would like our dealers to give the service and support our customers need. A lot of what's going to differentiate one computer from another in the future is going to be those kinds of service support issues."

Gene Carson, one of the center's managers, feels short turnaround time will be a major plus for the store. "When your personal computer breaks down," he said in a statement, "you won't have to ship it to a remote service center and wait days or weeks for its return. Just drop the equipment off at our center and, in most cases, we will have it ready for you within 24 hours, sometimes even while you wait."

The center will chiefly do component repair, Marketing Communications Manager Gill explained. Components will be repaired on their original boards. However, there's an exception to this rule when there's heavy traffic in an item. "We'll say, 'Okay, these boards are the ones that typically go bad,' " Gill said. "We'll stock those boards, replace them when they come in, and turn them around in 10 minutes."

He explained, "A lot of things that go wrong with a micro are very common and don't require an exotic part or something of that nature."

"Printers give the biggest problems of the mechanical devices," he continued. "Any mechanical device is subject to wear."

Inside the micro, he noted, problems usually originate with disk drives, which are mechanical, or blown fuses.

He added, "The biggest single problem is mishandling diskettes."

Prices at the center are fixed at $25, $50 and $100, Gill said. If it appears a repair will cost more than $100, a customer is notified. "We will do an estimate on it," he added, "and stick to that estimate."

Manager Carson said the center warranties repairs for up to 90 days. Future plans call for service contracts where customers can sign yearly agreements to cover maintenance and service on their equipment.

The center also provides computer supplies, software, publications, and a computer bulletin board.

Gill added the center will upgrade a customer's micro. "We will not recommend anything," he said. "However, if someone comes in and asks if this thingamajig will work with that gizmo, we will look at it and tell them if it will or won't."

Extensive expertise and a large parts inventory are keys to the center's effectiveness, Carson maintained.

"Our four managers have nearly a half century's experience among them," he said. And according to TRW, its service division services more than 700,000 pieces of equipment for 80,000 customers and makes more than 2 million service calls annually.

"We have an extensive parts inventory," Carson added, "and what we don't have we can get overnight from one of our commercial repair centers."

Carson's statement mystified Jon Campbell, press relations manager for Texas Instruments' Consumer Group. "I spoke to the people that run our repair center and they have not heard from TRW about this," he told *80 Micro*. "They were a little puzzled. How could TRW do repairs on the 99/4A if they haven't contacted us for spare parts?"

He said, "We do not have any outside arrangements to repair our units and we are not looking for any."

He added if a 99/4A were still under warranty when TRW repaired it, the TI warranty would be voided.

Texas Instruments has 50 exchange centers in the nation, he explained, where, if a 99/4A breaks down, its owners may exchange it for a new one or have it repaired. Exchanges are free during the warranty period,

BLACK JACK STRATEGY

By: Norman J. Wazaney Jr.

Play Like A Winner!

This complete system provides simple, step-by-step instructions to help you raise your level of play regardless of your present skill. Features include a SIMULATOR for testing betting and playing strategies, a TUTOR to teach the strategies and a GAME with all the options available at the casinos. Another outstanding feature is a Strategy Table Compiler for ease of entering and visualizing your playing and betting strategies.

The system is able to simulate millions of hands and provides better insight into computing odds and house percentages. You may be surprised to discover how many of your pet theories are less than accurate.

The comprehensive documentation is packaged in a handsome, easel-backed binder. Available now for only $69.95.

Since winning is always more fun than losing, be fair to yourself and get Black Jack Strategy before your next visit to the casino (where $69.95 will not go very far).

To order by phone, call 800-526-9042 and use your Visa or MasterCard. All shipments made the same day in which orders are received. To order by mail, add $1 for shipping charges and send your check to:

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200 Route 17, Mahwah, N.J. 07430.

Black Jack Strategy runs on 48K Apple II, Applesoft in ROM.
3.3 DOS/One Disk Drive Printer Optional

Circle 211 on Reader Service card.

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*Apple II and Applesoft are registered trademarks of Apple Computer Co

$45 after the period ends. Costs for repairs range from $25 to $80.

Other computer manufacturers hadn't heard of TRW's efforts in servicing personal computers.

Commodore, whose business systems are serviced by TRW, was unaware the TRW center might be servicing VIC 20s.

A spokesman for Commodore said if something goes wrong during the VIC 20's warranty period, it can be returned to point of purchase for a new machine. After the warranty expires, he added, VIC 20s are sent to one of Commodore's factories and the user is sent a factory reconditioned unit within 48 hours.

"The Commodore 64," he said, "is only being sold through computer dealers. All computer dealers are required to be service centers as well. The dealers can solve 90 percent of the problems that come up. The other 10 percent will be referred to regional service centers."

An Atari spokeswoman said she recommended Atari computers be brought only to the 1500 service centers the firm has established across the country.

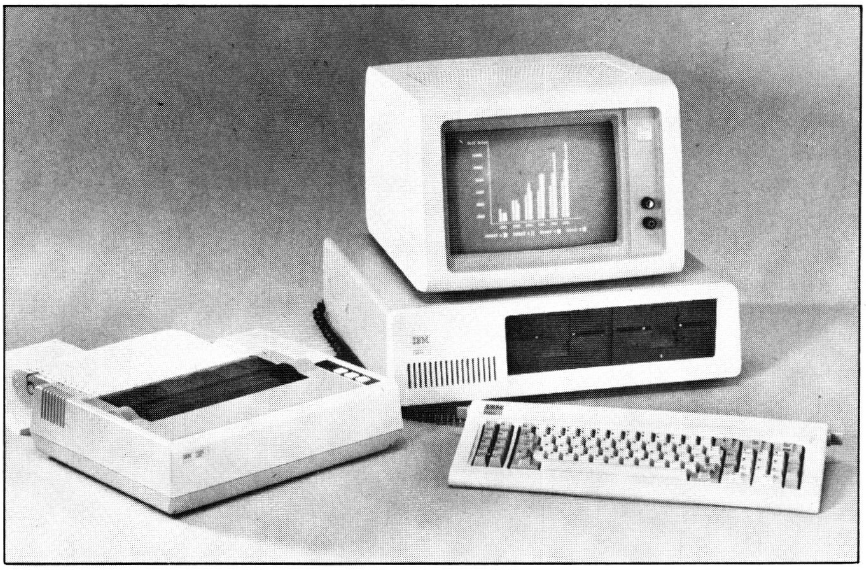
The first TRW center opened last October. This month or next, TRW will be assessing it to see if they should start up more of them. "If things are growing and we've got a steady trend upward, we will expand to as many as 15 more places next year," Gill said.

Planning and Development Director Harnett added, "Besides providing first-rate service, I believe these centers will help take some of the mystique out of computer usage.

"The more people realize that computers can be like other equipment they use daily to make life easier, the more computers will be found in the smaller office and home. By repairing them quickly and effectively, we're promoting this message." ■

Gray Market Makes IBM See Red

International Business Machines follows path of Apple.



IBM PC: Wildcat upgrades irk Big Blue.

International Business Machines has taken a page out of Apple Computer's book and notified its approved personal computer dealers that selling to unauthorized resellers could lead to termination.

According to the *Electronic News*, in a bulletin issued from its Systems Products Division in Boca Raton, FL, the Big Blue stated:

"Adherence to the requirements of this bulletin is required to assure end-user satisfaction and meet the terms of the Dealer Agreement. Failure to adhere to these terms and conditions would be considered a breach of contract and could result in termination as an Authorized IBM Personal Computer Dealer."

Reportedly, IBM attorneys are reviewing the status of at least one authorized dealer who is said to have unloaded stock to an unauthorized New York City reseller.

The electronics industry newspaper reported that the bulletin to IBM dealers, dated Oct. 29, 1982, was issued following the reported cutback by IBM in the availablity of low-memory versions of its personal computer.

Several authorized dealers told the *Electronic News* IBM has curtailed production of a 16K model of its Personal Computer to prevent unauthorized dealers from purchasing the unit, upgrading it with inexpensive RAM and disk drives to imitate the 64K version of the PC, and marketing the maverick machine at prices well below the prices offered by approved dealers.

The industry journal quoted IBM Director of Sales and Service H. L. Sparks as saying, "We are starting to see some more of it [unauthorized reselling]," but "It is not at a level that would generate great concern. He said IBM issued the bulletin "to further amplify for our dealers some things we have covered before."

The bulletin IBM sent to its dealers does not specifically mention underselling by unauthorized dealers as a concern, but points out that the sale by unauthorized dealers threatens to

PANDEMONIUM

By Norman J. Wazaney Jr.

A word game for our time.

At last... a computer word game that entertains, challenges, educates! Pandemonium is thoroughly fascinating, stimulating, and highly addictive.

Features include a built-in 6000 word dictionary, scoring display and a player selectable clock.

Play it alone! Play it with your kids! Play it at a party!

The word is out... Pandemonium is in.
Available now for only $39.95 at computer stores.

To order by phone, call 800-526-9042 and use your Visa or MasterCard. All shipments made the same day in which orders are received. To order by mail, add $1 for shipping charges and send your check to:

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TRS-80 MOD I/III 48K TRS-DOS
TRS-80™ Radio Shack/Tandy Corp.

48K Apple II, Applesoft in ROM, 3.3 DOS
Apple is a registered trademark of Apple Computer Co.

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Circle 212 on Reader Service card.

tarnish IBM's reputation for service and support.

The bulletin also noted, "The delivery of initial systems and products to users by other than a personal meeting between the end-user and trained dealer personnel is not consistent with the principle of end-user satisfaction through dealer support."

Recognizing that a cadre of third-party add-on suppliers is emerging with products that enhance the IBM Personal Computer, the Big Blue said in its bulletin that the dealer need not be involved in the user's addition of non-IBM add-ons.

Meanwhile, IBM reportedly is considering terminating one of its authorized dealers for selling PCs to 47th Street Photo, a New York City electronics dealer.

Late last year, 47th Street priced a 64K IBM system at $3299. That system included two Tandon 320K disk drives, 12-inch black and white monitor, and a monitor adapter.

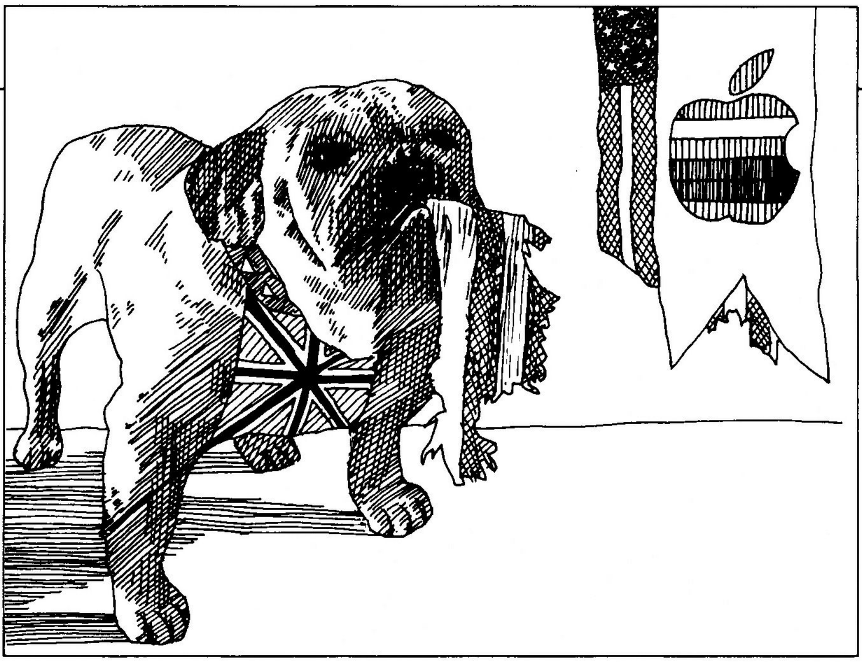
The IBM bulletin, *Electronic News* said, echoed a letter sent last spring by Apple to its dealers. In that letter, the Cupertino firm threatened to cut off any unauthorized dealer selling to unauthorized resellers.

At the time, Vice President for Marketing Gene Carter noted Apple had "become increasingly concerned about sales of Apple products by unauthorized dealers," and said any dealer that had been marketing to resellers should cease doing so or face termination.

Carter later told the *Electronic News* Apple, before the end of 1982, would act against dealers violating their agreements with Apple.

The industry weekly said Apple has retained a Phoenix law firm to investigate the matter. The firm is checking the origin of the Apples sold by unauthorized dealers by buying from them and tracing the purchases through their serial numbers.

Apple's investigation of unauthorized transhipping follows its ban late last year of mail order and telephone sales. That ban led to the dismissal of six dealers, who currently are contesting their termination in federal court in Los Angeles. ■



UK Micro Makers Call for Embargo

Purchase of Apples by leading British bank pumps ire of one computer manufacturer.

A UK computer executive railed against fellow Britishers buying Apple micros at a press conference calling on Prime Minister Margaret Thatcher to impose a one-year embargo on U.S. and Japanese micros.

According to *MicroScope*, a microcomputing fortnightly published in the United Kingdom, John Burrow, marketing director for Casu Electronics, rapped a major British bank for buying "those damn Apples."

Burrows claimed the bank bought the Apples because one of its executives' sons had one at home.

The marketing director refused to name the bank in question. However, later in the press conference, he recalled how "Barclays Bank had neglected to buy British."

The import embargoes were demanded by the British Microcomputers Manufacturing Group.

MicroScope reported the group also wants all British microcomputer manufacturers to be considered for government contracts as a right, to the exclusion of foreign micro makers.

"The BMMG does not suffer from xenophobia," said managing director of LSI Computers Tom Fitzpatrick, "but we do feel that we cannot overemphasize the problems which will face this country if we allow our microcomputer industry to be smothered in its infancy by unfair foreign competition."

He said UK micro makers had insufficient funds to match the marketing efforts of foreign competitors, and that the UK's Central Computer and Telecommunications Agency—which selects micros for all government purchases—was helping the foreigners.

"A £700 million industry is threatened not only by the Japanese and American imports but also the attitude of the CCTA," he said.

David Broad, chairman of Commart and the micro group, said foreign manufacturers were selling at artificially low prices which were "unfair to British manufacturers."

HUNTINGTON COMPUTING

Softlights

By Fred Huntington

Did you know we send out twenty thousand or more sales bulletins every two months?

Did you know that our sales are probably the best sales you've ever seen? Last month we sold the Elephants at an introductory price, the people who got the sales bulletins were able to buy them a month before the rest of the country.

One of the items in the current sale is ribbon cartridges (not just refills) for the MX-80 at **$4.99** each, MX-100 **$14.99.**

How do you get on the mailing list? There's only one way. That's to place an order. Requesting a catalog won't do it. But, once you buy from us, you're stuck on our mailing list.

Future sale flyers will contain fabulous bargains, both old and new items.

So, to entice you to want to get on the mailing list, there are some super specials listed elsewhere in this page.

SUPER-DUPER JOYSTICKS

Last month Barb ordered me a Wico joystick for evaluation without telling me first. When it came in I couldn't believe it. It is the most substantial joystick for the Atari I've ever seen. It's made by the same people who make the ones for the commercial arcade games. Made for the Atari, they will work with the Apple with an adaptor or the Joyport. There's also a fancier model with a chrome shaft and red ball on top. They also make a trackball controller that will blow your mind.

#160	**Command Controller** ($29.95) now	**$24.44**
#161	**Red Ball** ($34.95) now	**$29.44**
#162	**Trackball** ($69.95) now	**$54.44**

These prices are good through Jan. 30, 1983.

VERBATIM CLEANING KIT - $5.00

Here's a loss-leader that we hope will entice you to buy from us. When you make any purchase, you can but a $12.95 Verbatim cleaning kit for only $5.00. One to a customer or family, only while supply lasts. When this ad was written, there were 400 on the way to us. So, when these are gone, that's it. Order stock #4012.

GENERIC COMPUTER GAMES

We're revolting! Whoops, I mean we're revolting against high prices in computer games. As part of our effort, we are publishing the only Generic Computer Games in the world. Originally costing $14.95 each, I've taken Skeet Shoot, Trap Shoot (both HIRES) and put them on one disk along with a picture of Great Grandma Huntington.

They are two of the first games ever produced by a very famous software company. I bought the rights for them for $200 and decided to have some fun with them.

Made for the Apple, they come complete with a yellow documentation page, reminiscent of what you would find in your local supermarket. (After all, our shipping warehouse was at one time a supermarket.) Order #9008 for only **$9.99.**

WURST OF HUNTINGTON

We're still getting rave notices about the Wurst of Huntington. People are amazed at how we cut the price of Wurst from $19.99 to **$9.99.** Once they see the program, however, they understand.

One customer wrote us saying that the Wurst was a tribute to beginning programmers all over the world who would like to sell their programs. Another praised us saying Wurst was everything we promised.

So, if you want the worst eight programs ever assembled on one disk (and have a little fun, too), order #9010 for **$9.99.**

COMPUTER ALMANAC

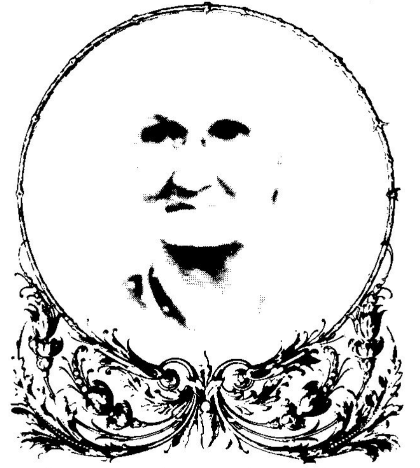
We think that Computer Almanac, written by Dave Carman is a good buy. It's a weather predicter, a loan amortization program, and a wealth of general knowledge. Order #9014 for **$24.99.**

UNDERSTAND YOURSELF

Written by Mike Taylor, Understand Yourself is a series of tests to help you get a better psychological insight of yourself. Not meant to be a clinical substitute, Understand Yourself is fascinating and will keep you and your mate intrigued for hours. Order #9012 for **$24.99.**

Here's something new for all you Epson MX-80 and MX-100 lovers — the MXPLUS. This amazing gadget allows you to use your printer buttons to instantly select the print mode you want.

For instance, press the "on line" button three times and you have instant double size print. Press twice and you have condensed print. No soldering, cutting or drilling. Easy to install. Does not interfere with normal operation of printer or software. Our price **$44.99.**



Great Grandma Huntington Cared

INTEGER FIX, ETC.

Here's an easy-to-use program that will covert your Integer programs to Applesoft in nothing flat. #9543. **$19.99.**

We also carry the complete line of Market software including Tennis Draw, League Schedule, Long Term Reservations, Swim Meet, League Standings and more. Call for prices.

We also have Masterworks, Nutricalc, Execuware, PCP, Thesis, and much, much more.

Here's a special to catch before the price increase. We're selling Advance Access disk boxes ($24.95 list before price increase) for **$21.99.** Buy two or more and you can have them for **$19.99** each. These are super storage boxes and will hold up to 90 disks each. I have five of them at home.

We've got Pac-Man Ghost pins for $2.50, Super-Fan II for $59.00, Master Diagnostics Plus for $55.00, Mail Ordering program $5.00, and Verbatim disks 10/$25.99 with a plastic carrying case.

STREET LIFE

We now carry Street Life, as featured in Play Boy. We don't recommend this for everyone and will not sell it to you if we even suspect you are under the age of twenty-one. Warning, some people may find the theme and language offensive. Our price, **$26.99.**

ATARI ATARI ATARI ATARI ATARI ATARI

Our collection of Atari games continues to grow. My personal favorite now is Frogger. Until Jan. 30 you can have this $34.95 game for only **$19.94** when you purchase any other item. Please specify cassette or disk. The graphics and sound on this program are superb.

Airstrike by English Software is a new game that has been very popular overseas. It only takes 16K and comes in cassette and disk versions. If you're bored by ordinary arcade-type games, Airstrike will present an enormous challenge to you. List price is $39.95. Until Jan. 30 you can have it for **$29.94.**

THANK YOU

Thank you to the many well-wishers on the birth of our son, Dale. He is very healthy and doing well. He's learning the computer business from the ground up. He's by Barb's desk every day. I'm sure many of you have heard him in the background when you call. You should see Barb trying to take an order over the telephone, punch numbers into the computer and nurse Dale, all at the same time.

One last item, we have a spiffy new lower case chip that's made for us locally. For a short time we are selling it for only **$15.00.** I wanted to call it the Buffalo Chip but I got out-voted. So, for $15.00 be sure to order the GGH lower case chip. (Can you guess what GGH stands for?)

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Circle 37 on Reader Service card.

According to the microcomputer fortnightly, the group's demands are likely to get short shrift at Whitehall. Recently, it said, Department of Industry Under-secretary John Butcher told businessmen that protectionism was a "thing of the past and the UK must meet the challenge from Japan."

Butcher added that the "international dimension is vital to our computer industries and only by allowing a flexible definition of British industry can we compete. This is an open market and must remain so."

Knocks of the group's demands didn't come only from Whitehall, *MicroScope* reported.

Martin Vlieland-Boddy, chairman of Torch Computers, slammed the group's proposals as "disgusting."

"I am disgusted that some of our competitors believe that the only way they can survive is by persecuting foreign products," he told the microcomputer newspaper.

"They expect," he said, to make their fortunes not from good products and aggressive marketing, but by closing the door on other countries' technology which, if better, should serve to give us all a good kick in the backside."

Further condemnation came from ACT, importers of Sirius computers from the United States. Marketing Manager Chris Buckham called the idea of an embargo "patent nonsense."

"It's embarrassing from the point of view of the industry as a whole," he observed. "If they could meet the demands of the British market, it might make some sense. But they're not even geared to meet the demand. They are damaging their own credibility."

And Clive Sinclair, whose firm is a member of the group, also frowned on the organization's initiatives.

"To introduce import controls now," he said, "would be a short-term and potentially damaging expedient which might lead to serious retaliatory action. It would not solve the fundamental problems." ■

Woz Returns

Pure research will be Apple daddy's goal while on board of card maker.

Apple founder and US Festival bankroller, Steve Wozniak, has joined the board of directors of Advanced Logic Systems of Sunnyvale, CA, which designs and manufactures peripheral interface cards for the Apple II.

Although Wozniak won't be an employee of the firm, he will be provided with an environment for "pure research."

Robert Ackerman, the company's marketing director, told *InfoWorld* Wozniak would be given a free rein to develop any kind of new product he was interested in.

"We have two or three ideas for Woz to work on, and he has some for us," the marketing director said. He added he hoped to interest Wozniak in designing for the CP/M world.

According to Ackerman, Wozniak will be provided with the "product goodies he needs" for his research.

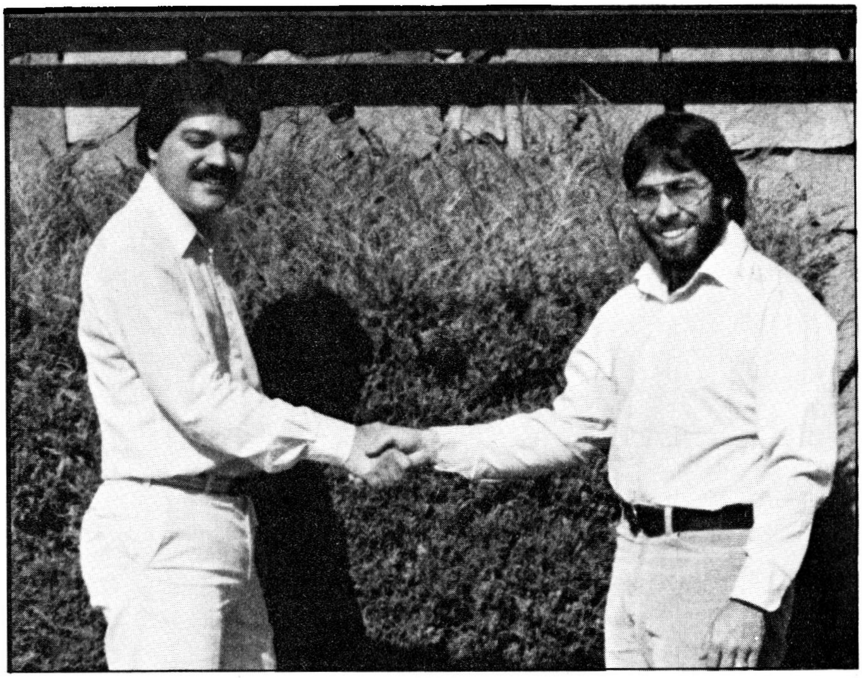
"Woz is going to help us succeed the way he has succeeded a couple of times before," Ackerman said.

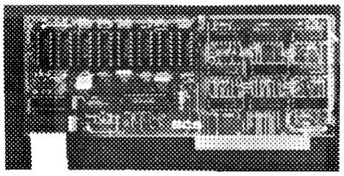
He added the Apple founder had made a "nice investment" in Advanced Logic.

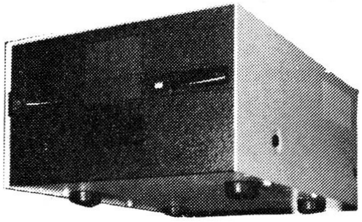
"We feel Steve's investment in ALS is a vote of confidence for the company's future success," President Dick Ribas said in a statement. "His technical and business experience will be an asset to our continued growth."

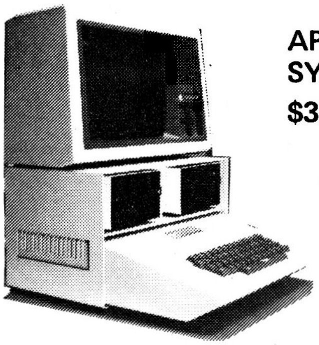
But computers aren't the only thing on the Apple daddy's mind. Wozniak, who has been studying computer science at the University of California at Berkeley, has recently announced plans for more music festivals along the lines of the US Festival held last fall in San Bernardino, CA. ■

Charles S. Mauro Jr. (left) welcomes Steve Wozniak to board of Advanced Logic Systems.









CP/M Plus— A First Look

Digital Research presents an enhanced version of its popular and versatile operating system.

by John Davidson

"Pick your rut carefully. You'll be in it for two miles." That's a sign once seen on a back Vermont road during mud season. Computer operating systems are like that. More often than not, your operating system dictates the programming available to you, and it's downright painful to change after you have hundreds of dollars invested in applications programs that are comfortable old friends.

The Apple II owner running CP/M from Digital Research, however, has his eggs in two baskets—Apple DOS and CP/M. The Apple material can be used with other Apples, but his CP/M files will follow him anywhere, even, God forbid, should he go out and buy an IBM Personal Computer.

Because of the intricate interface between application program and operating system, the thought of changing systems and then either abandoning or revising the entire program library usually strikes terror into the heart of the most stalwart computer owner. If you are presently running CP/M (Version 2.2), no such trauma awaits in the upgrade to CP/M Plus. All your programs running under CP/M will go on the Plus without change, and you will enjoy many improvements and enhancements.

Double Plus

There are two configurations of CP/M Plus (actually CP/M 3.0): banked RAM and non-banked RAM. The selection is made at initial installation (often by your vendor), but with some effort it can be changed later in the field. Banking refers to the fact that the normal 16-bit address bus can only access 65536 (64K) locations. For more than 64K of memory you can either go to an extended (more than 16-bit) address bus or you can use banking—several 64K memory boards in parallel, selecting the one you want by enables and disables issued through an input-output port. CP/M Plus can, in the banked mode, manage as many as 16 such boards at a time, for a total of a megabyte of on-line storage. Cray and IBM, take notice!

Of course, for the average Apple owner that means buying more memory and hardware—in the banked mode CP/M Plus needs a minimum of 94K of RAM on line. But you really did want to expand anyway, didn't you? The non-banked configuration needs only the normal 64K, and, when you pile the pennies for the extra hardware, the change can still be made.

Disk storage capability is up. The maximum number of drives remains at 16 (that's nearly gone infinite anyway), but capacity is now 512 megabytes per drive (more than half a billion!) versus 8 M with 2.2. Maximum file size is now 32 M compared to 8 M with CP/M 2.2.

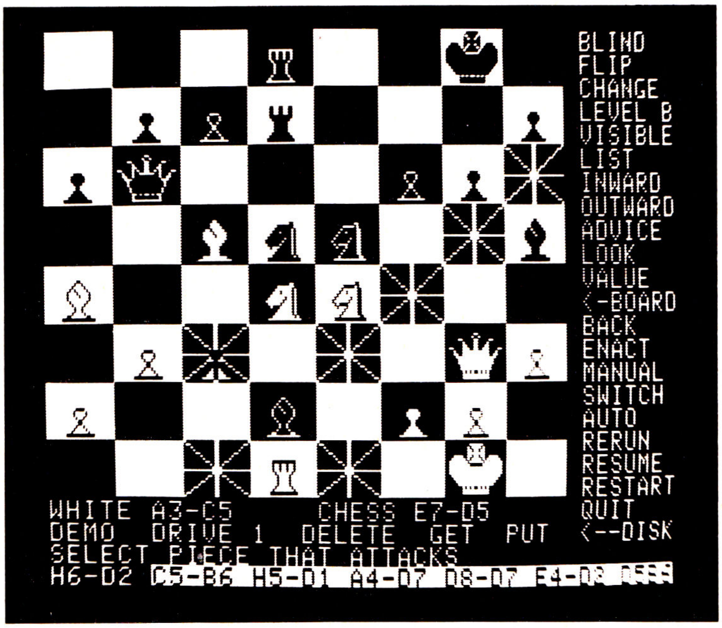
Disk handling has been improved. A hashing scheme speeds directory lookup during file accessing, and CP/M Plus will also read or write more than one sector at a time. Fewer trips to the trough (disk) makes for much faster operation. Once you are on the disk, the incremental time to access additional sectors will be much less than the time to do an entire disk read or write operation. As a bonus, there will be less wear on all those valuable little parts in your disk drives.

Better yet, if you are using the banked option mentioned earlier, CP/M Plus offers "Least Recently Used" (LRU) record buffering. Suppose you are running a Data Base Management System (DBMS) program that is rummaging around in data files. Under CP/M 2.2, each record access required a read of that record from the disk (much clanking and grinding). CP/M Plus, on the other hand, saves a number of these records in otherwise unused memory (record buffers). When the program asks for a record, Plus checks its buffers before doing the disk read (taking micro-

---

John Davidson is a Professional Engineer. He has been working with microcomputers since 1975. Address correspondence to him in Marlow, NH 03456.

Explore the Frontiers of Intelligence



```
BLIND
FLIP
CHANGE
LEVEL B
VISIBLE
LIST
INWARD
OUTWARD
ADVICE
LOOK
VALUE
<-BOARD
BACK
ENACT
MANUAL
SWITCH
AUTO
RERUN
RESUME
RESTART
QUIT
WHITE A3-C5      CHESS E7-D5
DEMO  DRIVE 1  DELETE  GET  PUT  <--DISK
SELECT PIECE THAT ATTACKS
H6-D2 C5-B6 H5-D1 A4-D7 D8-D7 E4-D3 [illegible]
```

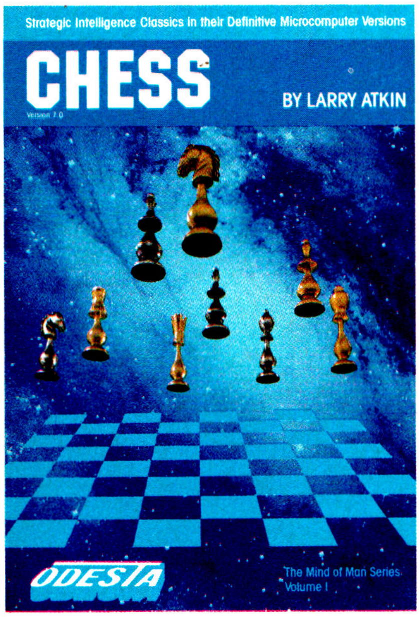
- ◀ Variations of blind-fold play—camouflaged or invisible pieces
- ◀ Invert board to play black on bottom
- ◀ Change pieces on board during game, or set up position
- ◀ Change between 15 levels of play, plus postal and mate-finder modes
- ◀ Show move that **Chess** is thinking about
- ◀ List played moves for each side
- ◀ Lines of force in: attacks and defenses on a square
- ◀ Lines of force out: squares attacked and defended
- ◀ **Chess** suggests a move
- ◀ Show moves **Chess** thinks you will make, and its responses
- ◀ Evaluation of a position
- ◀ Return to board or switch to command menu
- ◀ Take back a move (repeatable)
- ◀ Play move suggested by look-ahead search
- ◀ **Chess** plays neither side
- ◀ Switch sides
- ◀ **Chess** plays against itself—one level against another
- ◀ Replay through most advanced position
- ◀ Skip to most advanced position
- ◀ Start new game
- ◀ Leave program
- ◀ Save, get, and delete games to and from disk

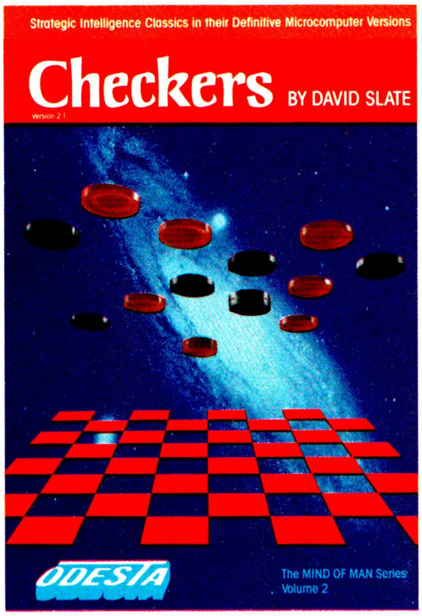
All features self-documented; all choices cursor-controlled
Screen shows "outward" and "look" features being used

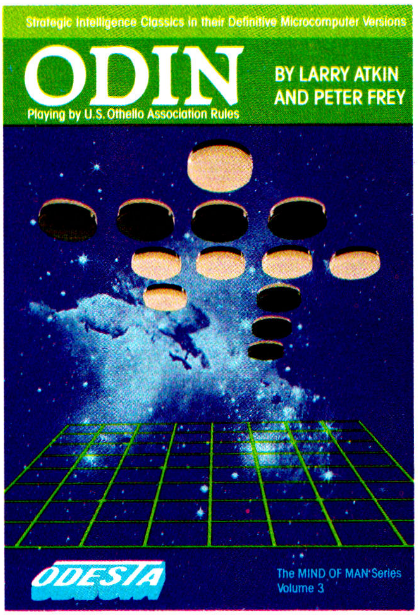
THE PEOPLE BEHIND THE PROGRAMS:

Larry Atkin & David Slate: Authors of the Northwestern University Chess 4.7 program—World Computer Chess Champion, 1977-1980

Peter Frey: Northwestern University professor
Editor: **Chess Skill in Man and Machine**
One of U.S. Othello Assoc.'s top-ranked players

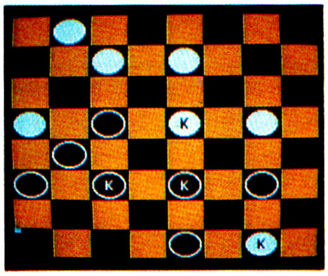




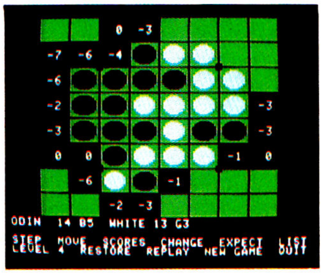


```
A - ADVICE
B - SETUP A POSITION
C - SET COLOR TO MOVE NEXT
D - DEMO PROGRAM
E - EVALUATION OF GAME
G - NEW GAME (OR START POSITION)
H - HELP (LIST OF FEATURES)
I - GIVE-AWAY - SWITCH TO OR FROM
K - SET ALTERNATE LEVEL FOR WHITE
L - CHANGE SKILL LEVEL
M - PROGRAM MAKES NEXT MOVE
N - HUMAN PLAYS BOTH SIDES
O - MUSIC OFF, OR BACK ON
P - PARAMETER CHANGES
Q - QUIT PROGRAM AND BOOT DISK
R - RESET PROGRAM
S - STOP SEARCH, MOVIE, DEMO, OR "W"
T - TAKE BACK A MOVE
U - INVERT BOARD DISPLAY
V - SET RANDOM NUMBER
W - PROGRAM PLAYS AGAINST ITSELF
X - REPLAY ONE MOVE
Y - CHECKERS MOVIE
Z - MOVE BEEP OFF, OR BACK ON
```

Checkers' features

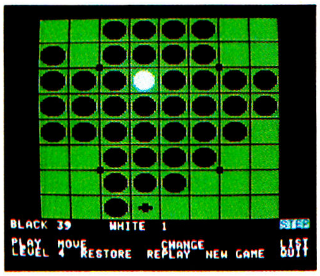


Black to move and win
(From Checkers documentation)



```
ODIN  14 B5  WHITE 13 G3
STEP  MOVE  SCORES  CHANGE  EXPECT  LIST
LEVEL 4  RESTORE  REPLAY  NEW GAME  QUIT
```

"Scores" feature in Odin



```
BLACK 39     WHITE  1                STEP
PLAY  MOVE          CHANGE            LIST
LEVEL 4  RESTORE   REPLAY  NEW GAME   QUIT
```

A clue to the secret of Odin:
Black is destined to lose.

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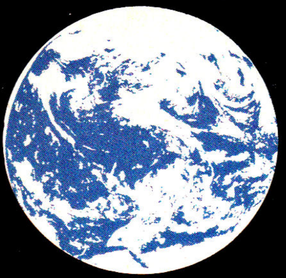

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seconds instead of tens of milliseconds). If it finds the desired record, no disk access is necessary. If not, the record is taken from disk and put into the buffer in place of the least recently used record, if no free buffer space is available. How much good the LRU record buffering will really do you in terms of time saved and disk accesses avoided will depend on the nature of your work and the programs you are using, but you can bet your bottom dollar that, as CP/M Plus spreads, program writers will jump on this feature and write code capitalizing on it.

Keyboard and Display

Many of the improvements of CP/M Plus are at the keyboard and display. For example, if you have a real-time clock in the system, CP/M Plus will sign on with the date-time group just like the big time-share mainframes. It will also insert the date-time group into your files as, for example, date-time a file was created and date-time of the last access. These date-time groups then appear in the DIRectory listings. Date-time can also be "called" as a system function by application programs. Thus, for example, if your system had an analog to digital converter and was reading and recording the outputs of several temperature sensors, the program could use the function call to record the times of maximum and minimum or the time crossing a preset temperature.

What happens, you ask, if you turn the computer off between uses? How does it keep track of the time? This is, of course, a hardware problem, beyond the purview of programming, but the answer is a combination of MOS (very low current drain logic) and a small, long-life, on-card battery. Think of the $8.00 digital wrist watch that runs for a year on two tiny Mercury cells. . .

Another classy touch, *a la* the big, BIG mainfrrme, is the "on-line" help files, although you must have the disk space to store them without cramping the rest of the operation. To use this feature, you merely type HELP followed by the name of the program that is giving you grief. (You must be in the CP/M command mode.) A menu will appear giving the names of the various program features covered in the help file. A single key entry then calls up either the entire file, page by page, or just those pages you need. Another key entry aborts the whole thing and returns you to CP/M. Help files for a number of common programs have been available for some time from the CP/M Users Group and it's good to see them incorporated into CP/M.

Those of us with ten left thumbs (actually it's really the fault of the keyboard) will appreciate an improvement in the handling of errors in keyboard commands. No longer will CP/M throw your error back at you with a slightly saucy question mark. Now the Command Control Processor (CCP) will prompt you in case of an error or missing argument. CP/M Plus will also accept multiple system commands on one line. (A bit like Submit without having to create a Submit file?)

Another big enhancement is that CP/M Plus will search all active disk drives looking for a requested file. Version 2.2 would look only on the working disk. Most user programs have the ability to change the logged-in disk (by specifying B:PROG.ASM), but if I had a dime for every time I forgot to put in the "B:". . . No more with Plus.

In the same vein, those who use the USER numbers will be pleased to know that USER 0 (that's a zero) is now public. No longer a disk filled with PIP.COMs, one to each user number! All the User 0 files are now available to any user number.

A real temper saver is the automatic log-in of a disk changed during operation. CP/M 2.2 responds to sneaky disk changes without a control-C with either hurt messages or total indigestion. The Plus version will take it all in stride.

> **"As the most widely used operating system in microprocessor history, CP/M has been subjected to a great deal of embroidery and embellishment."**

Added Utilities

A number of utilities are included with CP/M Plus:

- DEVICE sets communication protocols and baud rates for character I/O devices. It also allows you to change device assignments and to assign program output to several devices.
- GET redirects console input to be read from a disk file. The input file can contain both standard CP/M Plus input and input to the application program.
- PUT complements GET by allowing application program and CP/M Plus system outputs to be directed to a disk file.
- SET allows you to set various file attributes and the date-time recording mode. File attributes include read-only and system (invisible to the directory command).
- SETDEF displays and defines the disk search order. With this command you can ask CP/M Plus to search more than one disk drive for a command file.
- SHOW displays information about the characteristics of a logical drive, such as capacity, number of directory entries and directory label information.
- SUBMIT lets you execute a command file sequence stored in a disk file. The file may contain both CP/M Plus system input and application program input.

CP/M Plus also offers the serious programmer a number of new "bells and whistles" at the application program interface. For example, your program can now trap system errors, it can ask CP/M Plus how much free space is available on the disk (with the old CP/M everything was roses until "disk full" clobbered you from behind, as it were), and several more program and I/O handling routines are available as direct system function calls.

As the most widely used operating system in microprocessing history (all eight or nine years of it), CP/M has been subjected to a great deal of embroidery and embellishment, privately, through a number of small vendors, among various users' groups and in many magazine articles. Some of these modifications and add-ons are great; others aren't. All the good ones seem to have been included in the revision. Thus, many of the "Plusses" of CP/M Plus aren't completely new, but now they have been tested, recoded as necessary and integrated into the system, bearing the imprimatur of the maker, an unquestioned leader in the field.

So, where is CP/M Plus, how do you get it, and what will it cost? For the avid glutton for punishment, CP/M Plus is available from Digital Research, right now, in an OEM (original equipment manufacturer) package with many nice utilities (MAC, SID and more) for $350. You will have to install it yourself, a job comparable to putting a Pinto engine into your Volkswagen.

The better way (much less painful) is to obtain it from the original supplier of your CP/M 2.2. By the time this appears in print, most suppliers will have gotten the Plus going on their machines. The cost for the update is set by the vendor, but Digital Research is hoping that they will be passing it on cheap—possibly free, or at a cost calculated to cover just the new disk and the handling. In any case, it should be well worth the price. ■

Pertinent names and addresses:

Digital Research
160 Central Ave.
Pacific Grove, CA 93950

SIG/M User Group
Amateur Computer Group of New Jersey Inc.
PO Box 97
Iselin, NJ 08830

CP/M Users Group (CPMUG)
1651 Third Ave.
New York, NY 10028

Keyboard Graphics

Your Apple can become a dynamic sketch pad, without the usual extras.

by Maria DeMarco

Have you ever wondered why it's necessary to have paddles or a graphics tablet to turn the Apple into a dynamic sketch pad? In fact, it's not necessary at all. By using the program in the listing, you will be able to use certain keys not only to draw but to move to another point on the screen or to erase what you have drawn.

The program uses both the primary and secondary pages of the high-resolution graphics, so an Apple with at least 24K bytes of memory is required. The program lets you create dynamic effects by switching between the two screens.

As outlined in the *Apple Reference Manual*, eight special memory locations control the setting of the soft switches for the screen. This program uses three of those switches. In line 305 a switch is used together with the HGR command so that the whole screen can be drawn on, instead of leaving four lines available for text. Line 405 uses the switch to display the primary page and line 410 employs the switch to display the secondary page.

When you enter the program, you will be in Draw mode and the color will be set to white (lines 100–120). Line 180 allows you to select any of the standard high-resolution colors

Address correspondence to Maria DeMarco, 641 Bathgate Drive, Apt. 210, Ottawa, Ontario K1K 3Y3.

Program listing. Animated high-resolution graphics program.

```
5  REM   DRAW AND SWAP PROGRAM
6  GOSUB 2000: REM   INITIALIZE CURSOR
8  HOME : PRINT
10  PRINT "******** DRAW AND SWAP SCREENS ********"
11  PRINT
12  PRINT "THE PROGRAM ALLOWS YOU TO DRAW COLORED"
13  PRINT "PICTURES BY CONNECTING STRAIGHT LINES"
15  PRINT "AND TO MOVE TO ANOTHER POINT ON THE"
17  PRINT "SCREEN BY SWITCHING TO MOVING MODE."
18  PRINT : PRINT "BLACK CAN ALSO BE USED TO ERASE."
19  VTAB 20: PRINT "PRESS ANY KEY TO CONTINUE ";: GET K$
20  HOME : PRINT
21  PRINT "THE FOLLOWING KEYS ARE USED FOR"
22  PRINT "SPECIAL FUNCTIONS IN THE PROGRAM:": PRINT
23  PRINT "'S' : SWITCH BETWEEN DRAWING/MOVE MODE"
24  PRINT "'E' : END OF PICTURE"
25  PRINT "'D' : MOVING DOWN FIVE"
27  PRINT "'L' : MOVING LEFT FIVE"
28  PRINT "'R' : MOVING RIGHT FIVE"
29  PRINT : PRINT "THE REPEAT KEY CAN BE USED"
30  PRINT "IN COMBINATION WITH D,U,L AND R"
31  PRINT "FOR FAST DRAWING OR ERASING."
32  PRINT : PRINT "ENTER NUMBER 0-7 TO SELECT"
33  PRINT "FROM HIGH-RES COLOURS"
34  VTAB 20: PRINT "PRESS ANY KEY TO CONTINUE ";: GET K$
35  HOME : PRINT
36  PRINT "PLEASE GIVE STARTING X AND Y"
38  PRINT "FOR EACH OF THE TWO PICTURES WHICH"
39  PRINT "YOU WILL BE DRAWING ON THE"
40  PRINT "TWO HIGH-RESOLUTION GRAPHICS SCREENS"
45  PRINT
50  INPUT "STARTING X1 AND Y1 ";X1,Y1
55  INPUT "STARTING X2 AND Y2 ";X2,Y2
60  GOTO 300
70  REM   SUBRT TO SWITCH BETWEEN
75  REM   DRAWING AND MOVING MODE
80  IF FL = 0 THEN FL = 1: RETURN
85  IF FL = 1 THEN FL = 0: RETURN
90  REM   SUBROUTINE TO DRAW ON
95  REM   EACH OF THE 2 SCREENS
100  REM   INITIALIZE COLOR
105  REM   TO WHITE
106 HC = 3
110  HCOLOR= HC
115  REM   INITIALIZE FLAG TO 0
120 FL = 0
125  HPLOT X,Y
```

Listing continued.

Listing continued.

```
128  REM   CURSOR XOR WITH SCREEN
130  XDRAW 1 AT X,Y: GET P$: XDRAW 1 AT X,Y
140  IF (P$ = "S") THEN  GOSUB 80: GOTO 130
150  IF (P$ = "D") AND (Y <  = 186) THEN Y = Y + 5
155  IF (P$ = "U") AND (Y >  = 5) THEN Y = Y - 5
160  IF (P$ = "L") AND (X >  = 5) THEN X = X - 5
165  IF (P$ = "R") AND (X <  = 274) THEN X = X + 5
170  IF P$ = "E" THEN  RETURN
180  IF  ASC (P$) > 47 AND  ASC (P$) < 56 THEN HC =  VAL (P$): HCOLOR= HC:
      GOTO 130
190  IF FL = 1 THEN  GOTO 130
200  HPLOT  TO X,Y
205  GOTO 130
300  REM   SET PRIMARY SCREEN WITH
302  REM   ALL GRAPHICS
305  HGR : POKE  - 16302,0
307 X = X1:Y = Y1
310  GOSUB 100
315  REM   SET SECONDARY SCREEN
320  HGR2
325 X = X2:Y = Y2
330  GOSUB 100
400  REM   DYNAMIC SCREEN SWAPPING
402  REM   AD INFINITUM
405  POKE  - 16300,0
408  FOR I = 1 TO 1000: NEXT
410  POKE  - 16299,0
418  FOR I = 1 TO 1000: NEXT
430  GOTO 405
1998  REM   SUBRT TO CREATE A
1999  REM   CURSOR SHAPE TABLE
2000  POKE 7676,1: POKE 7677,0: POKE 7678,4: POKE 7679,0
2010  POKE 7680,18: POKE 7681,63: POKE 7682,32: POKE 7683,100
2020  POKE 7684,45: POKE 7685,21: POKE 7686,54: POKE 7687,30
2030  POKE 7688,7: POKE 7689,32
2032  POKE 7690,0
2040  POKE 115,252: POKE 116,29
2050  POKE 232,252: POKE 233,29
2060  SCALE= 1: ROT= 0
2090  RETURN
9000  END

]PR#0
```

from 0–7 by entering the desired number on the keyboard. Pressing the S key will allow you to move the cursor without drawing. When you press S again to switch back to Draw mode, you will be drawing in the last color you selected.

I have inserted a pause into the program by means of an empty loop, to slow down the screen swapping:

```
408 FOR I = 1 TO 10000: NEXT
418 FOR I = 1 TO 10000: NEXT
```

Alternatively, you could slow down each switch by a different pause duration, or slow only one of the switches.

Subroutine 2000, which creates a shape table defining the cursor, is used only once, at the beginning of the execution of the program. XDRAW (line 130) does an "exclusive or" between the cursor created in the shape table and the screen. This allows the cursor to be drawn and undrawn without erasing the background. ■

Pascal Primer

This first in a series of Pascal programming tutorials will help you get started.

by John Stephenson

The UCSD (University of California at San Diego) p-System is a complete operating and developing environment. Necessary tools and utilities are provided. The selection of single-keystroke options from hierarchical command lines at the top of the CRT allows easy movement from one part of the system to another. Most impressive is the full screen-oriented editor with its parameters for program or document preparation.

The "p" in p-System stands for "pseudo." The p-System environment is not limited to Pascal, although Pascal is its primary language. Compilers are programs that process other programs written in source languages, such as Pascal, Fortran or Basic, into the object or machine code of a specific processor chip. The p-System compilers produce code that runs on a pseudo (idealized) processor. During execution of the code on an Apple II, another program, called an interpreter, translates the idealized chip instructions into real 6502 instructions. The 6502 processor is the heart of the Apple.

The compiled/interpreted architecture has certain effects. Execution of the same p-code on a microcomputer that has a different processor than the Apple's requires only a change in the interpreter. Armed with interpreters for popular processor chips such as the Z-80, 8080, 8088, 8086, 6502 and 68000, one could execute the same p-code on any microcomputer that uses these chips. Such hardware independence increases the availability of software products—good news for programmers and users. In addition, execution speed is substantially increased since the idealized p-machine instructions can be more efficiently interpreted than Applesoft instructions.

First Impressions

Most Apple computer owners are familiar, to some degree, with Applesoft Basic. Some have written programs beyond what was thought possible in that language. Upon first experiencing Pascal, it is natural for Apple owners to compare it with Applesoft. Here are some observations.

Giving procedures meaningful names, such as "CompressBuffer" or "SortList," rather than Basic's style of GOTO 3110 or GOSUB 515, controls logical flow inside a Pascal program. Line numbers are not found in Pascal programs. Gotos are not usually found in Pascal programs since Gotos need line numbers.

The many data constructs in Pascal clarify and enrich program expression. Unlike Applesoft, things can be described to the computer in terms closer to how the things are perceived by people. For example:

```
weekdays = (monday, tuesday, wednesday,
            thursday, friday);
suits  =  (clubs, diamonds, hearts, spades);
```

But Pascal source must first be processed by the Pascal compiler (itself a Pascal program), as contrasted to Applesoft's straightforward Run command. The compiler outputs a ".code" file based upon the input ".text" file. The compiler's merciless insistence on perfection plagues poor typists and those unsure of proper Pascal syntax. Consequently, using Pascal for composing short or throw-away programs can be tedious; Applesoft is still best for these tasks.

After a Pascal ".code" file is successfully generated, it runs faster than an Applesoft equivalent program. The ".code" file occupies less disk and memory space than its associated ".text" file, and is, in fact, independent of it. The ".text" file may (and should) be saved on a separate disk. The ".code" file stands alone for program execution.

In a Nutshell

Most Apple owners acquire Pascal by purchasing the Apple Language System; about 20 percent of all Apple

---

Address correspondence to John C. Stephenson, 9118 Smith Ave., North Bergen, NJ 07047.

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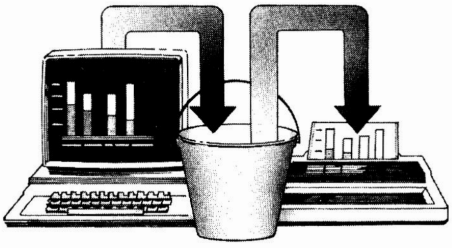

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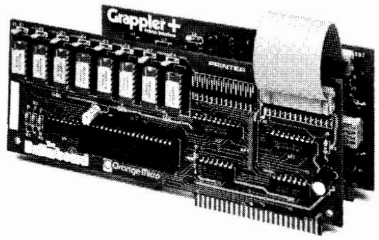

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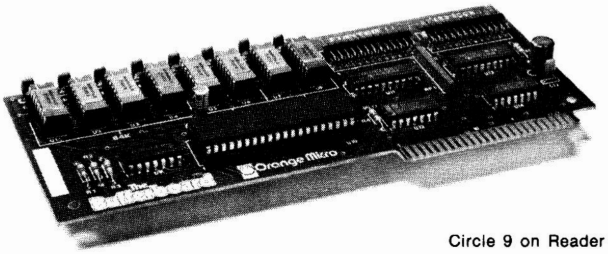

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Program listing 1.
Programs to print name on screen.

```
PASCAL VERSION

program printname;
{ Program to print name }
var
            name:                   string;
begin
            write ('Type your name: ');
            readln (name);
            writeln ('Your name is ',name);
end.


BASIC VERSION

10  REM PROGRAM TO PRINT NAME
20  INPUT "TYPE YOUR NAME:   ";NA$
30  PRINT "YOUR NAME IS   ";NA$
40  END
```

owners have purchased it. The package includes a language card to be installed in slot #0, manuals, and system disks. Apple Computer will send updates to inform all those who send in their registration cards. Become familiar with the system by reading the installation booklet and the sections in the manuals about the formatter, filer, editor and compiler. Use the formatter to initialize disks and the filer to back up your original disks. Use the editor to enter your programs and the compiler to prepare programs for execution.

A common first program is one that writes the author's name on the screen. Listing 1 shows this, written in Applesoft and in Pascal. Listing 2 shows the skeletal form of a Pascal program. Comments between curly braces are remarks, analogous to Applesoft's REM statement. Apple keyboards not able to produce the curly braces can substitute "(*"and "*)." The comments explain the different parts of the skeleton.

The CONST section associates constant values with an easily referenced name. For example:

```
CONST

ASCIIBell = 7;
Copyright = '(c) Copr. 1983 Chuck Wagon';
HighBit = 128;
```

The TYPE section defines the kind of data the program will operate upon. Pascal manipulates the simple data types of Boolean, CHAR, Integer and Real. A string is predefined as an array of characters with a length attribute. Other data types are created by combining the simple types. For example, structures of different components are expressed as records:

```
  TYPE

  monsters = record
           name:           string;
           combatRating:   real;
           condition:      (dead, wounded,
                           stunned, fit);
           level:          integer;
           end;
```

With records, things logically grouped together can be handled as a single entity. Structures defined in the TYPE section are used to create variables in the VAR section. Using the structure above, space for recalling an assortment of creatures from disk may be allocated:

```
VAR

SwampMonsters   : file of monsters;
FlyingMonsters  : file of monsters;
```

And a ferocious dozen may be assembled with the declaration:

```
NastyFellows    :array [1..12] of monsters;
```

All globally accessed variables are declared at the top of the program. Space in memory is automatically set aside prior to program execution.

Support procedures and functions in Pascal (the equivalent of subroutines in Applesoft) can operate on global variables, but can also have private variables. They usually communicate with the rest of the program through parameter lists. Unfortunately, in Applesoft, all variables are global. Private variables are preferable because there is less danger of side effects; that is, there is less likelihood of unintentional influence on another part or operation of the program. Procedures operate on the items passed in the parameter list. Any special structures or variables needed to accomplish their job are invisible to the rest of the program. Procedures may call themselves, leading to elegant solutions to some difficult problems.

```
procedure DirectHit (var Herman:monster);
begin
   if (Herman.condition = dead) then
      writeln ('You just shot a dead monster')
   else Herman.condition : = prec(Herman.
      condition);
end;

procedure HealMonster (var Herman:monster);
begin
   if (Herman.condition<fit) then
      Herman.condition : = succ(Herman.
      condition);
end;
```

In the two procedures above the programmer passes the identity of any monster, who is automatically substituted for Herman, and is either healed or wounded. If the healing or wounding processes are changed later they may affect the monsters differently, but they will not affect the exterior program structure.

Variables may be declared ahead of time, or they may be created spontaneously by using pointers and a procedure that is part of the operating system called NEW. The first kind of variable is called static, and the second kind is called dynamic. Dynamic variable structures can grow or shrink in size during program execution and thus economize use of memory.

```
procedure JAWS
TYPE

Others          = ^Integer;
NewMonster      = ^Monster;
begin
  Mark (Others);
  NEW (NewMonster);
  NewMonster^.name: = LandJaws;
  NewMonster^.condition: = fit;
end;
```

The code fragment above created space in memory for an additional monster record. The location of this space is remembered by calling the operating system procedure MARK, and later reclaimed by calling the operating system procedure RELEASE.

Another way to get the most from available memory is to declare various procedures as segment procedures. This will keep procedures out of RAM and on the disk while they are not in use. For example, a program may consist of 500K worth of procedures. As long as they are segmented and do not have to be in memory at the same time, the oversized program can run on the 64K Apple II. This accounts for the mysterious disk whirring in the midst of some Pascal programs. It has special significance for those with fast access hard disks.

More control statements are available in Pascal than in Applesoft. The If

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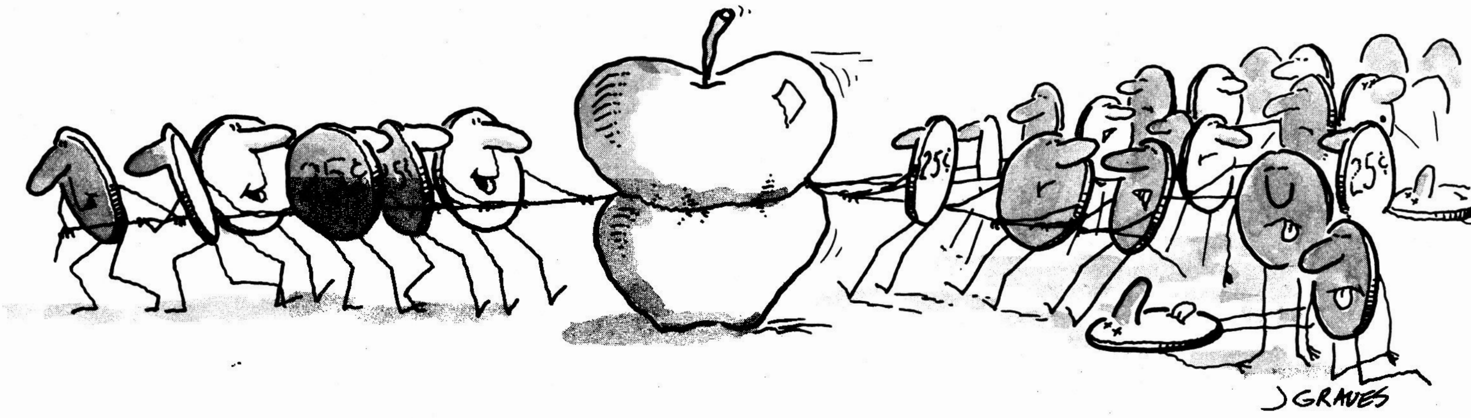

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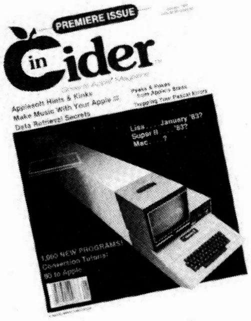

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Program listing 2.
Pascal program skeleton.

```
Program Example;                       { Programs begin with the key word
                                         "program" followed by a name.            }

Uses SupportUnits;                     { Programs may use precompiled library
                                         routines.                                }
const
             { Constants declared here are globally available.                    }
type
             { Types defined here are globally available.                         }
var
             { Variables defined here are globally available.                     }

             procedure A (var param1:integer);

             {The first support procedure for program Example. It is passed an integer
              parameter called "param1." It is a "var" parameter: if procedure A alters
              its value it will be changed in the program, as well.   }
const
             { Constants only available to procedure A.                           }
type
             { Types defined only for procedure A and its sub
              procedures.                                                         }
var
             { Variables defined only for procedure A and its sub
              procedures.                                                         }

             procedure AA;
             { Private support code for procedure A.   }
             begin
             end;
begin
             { Implementation of procedure A with calls to AA.                    }
end;

procedure B (parameter1:Boolean; parameter2:char);
begin
             { Can call procedure A, but not AA which is unknown to it. Procedure B is
              passed a Boolean and character parameter. It may change their values to ac-
              complish its own processing, perhaps to alter a program global, but any
              changes in them will not be in effect outside this procedure.          }

              end;

begin
             { Main program code which calls A and B with various parameters.     }
end.
```

statement may have an Else clause. A multi-branch If statement is handled by the case construct. The For statement is more limited because the stepping increment must always be 1. The While-do and Repeat-until statements have no direct Applesoft equivalents. The While statement checks a programmed condition and will iterate a series of statements as long as that condition is true. If the condition is false to begin with, the series of statements is bypassed. The Repeat statement will execute the series of statements at least once, checking the programmed condition after each iteration. The subtle differences between For, While and Repeat allow clearer definition of program flow.

If computers could not communicate with the outside world, they would be useless machines. In Pascal, communication is accomplished between devices (such as keyboard, screen, printer, disk, and modem) at different levels, depending on the task at hand. The Read and Write commands are used for character-oriented communication. The Seek, Get, and Put commands are used for record and random access communication. The BlockRead and BlockWrite commands are used for raw, buffered communication. The UnitRead and UnitWrite commands are used for raw, byte-stream communication.

The code fragment below might be used to recall some of the monsters from a disk file:

```
segment procedure initialize;
var
  I : integer;
begin
  reset (SwampMonsters, ‘*Swamp.data’);
  for I: = 1 to 12 do
    begin
    seek (SwampMonsters, I);
    get (SwampMonsters);
    NastyFellows[I]: = SwampMonsters^;
    end;
  close (SwampMonsters);
end;
```

Some History

Niklaus Wirth, using some concepts already expressed in the Algol language, designed generic Pascal in the late 1960s. He intended Pascal to be a teaching tool, encouraging and enforcing what he called "stepwise refinement," just an earlier way of saying "top-down design." Wirth wanted Pascal to be used on as many processors as possible.

In the United States, Pascal was first used at the University of California at San Diego on their Burroughs B6700 batch-oriented mainframe. To adapt it to PDP 11s and later to various microcomputers, extensive development was undertaken, resulting in the p-operating system, editor, filehandler, librarian, and other tools. The UCSD development team added extensions to the original language including string handling and floppy disk accessing. This led, in the late '70s, to UCSD Pascal 1.0.

UCSD granted various individuals and groups, including Apple Computer, licenses to distribute their system. For a nominal charge the entire source was available, and hacking was encouraged. Soon, however, the University's tax exempt status came into question since they were alleged to have entered the software business. In self-defense or, possibly, abject fear, UCSD abruptly cancelled all licenses to distribute their system. They turned the whole package over to Softech Microsystems, which agreed to support its continued professional development, and thus protected the University's tax exempt status.

However, unlike other contracts, Apple's license contained a non-cancellation clause. Some people at Apple Computer saw the value in Pascal and planned to forge ahead with it on their own.

Apple Computer released Apple

> **"Compared to Apple's other documentation of award-winning quality, the infamous 'white book' was shocking."**

Pascal version 1.0 in 1979. Although it was a delight to hard core Apple owners, it was full of bugs and poorly documented. Compared to Apple's other documentation of award-winning quality, the infamous Pascal "white book" was shocking. During the next year Apple Computer suffered complaints and criticisms from their first Pascal users. Meanwhile they quietly fixed the bugs and revised and expanded manuals. Apple Pascal version 1.1 was the result—a totally professional Pascal system that became the standard for 8-bit machines.

As Apple was developing its Pascal system, Western Digital produced their MicroEngine, which had the p-machine burned into ROM. Since interpretation was bypassed, code files were executed quickly. Western Digital also introduced concurrent processes in their machine, but were unfortunately haunted by stories of unreliability.

Meanwhile, Softech Microsystems (the firm charged with safeguarding Pascal's continued professional development), was working on version IV.0. They had released some version II.0 systems to run on CP/M machines, but the results were less than satisfying to their customers. With the release of version IV.0, nearly complete source level compatibility was maintained with previous versions while a new and sophisticated runtime architecture was introduced. Though larger and slower than Apple Pascal 1.1 on 8-bit systems, version IV.0 works well. It is well suited to the high performance 16-bit systems and offers still more professional features.

Softech's version IV.0 is available for the Apple II and is up and running on an impressive selection of microcomputers. By the time this article is published, Softech Microsystems will probably have completed enhancements currently in production, and will have upgraded to version IV.1. It is also rumored that Apple Computer has their own upgrade in the works. They have also released Apple III Pascal, with some impressive features. ■

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Clark, Randy, and Stephen Koehler. *The UCSD Pascal Handbook*, Prentice-Hall, 1982. Oriented toward Softech's version IV.0, this is probably the clearest and most concise introduction to UCSD Pascal, and is handy to keep around for reference while programming.

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Pascal Market News, PO Box 5314, Mt. Carmel, CT 06518. New products and who's selling what. $20 yearly.

Schneider, G. Michael, and Stephen B. Bruell. *Advanced Programming and Problem Solving with Pascal*, John Wiley, 1981. A remarkably clear, complete and readable text. Highly recommended.

Apple-Mate, Friend or Foe?

Thinking of purchasing an Apple compatible drive, but don't know which one is best? Here's one review that might aid in your final decision.

by Lee E. Sumner, Jr.

The Quentin Research Corporation is offering a plug-compatible drive for the Apple, called the "Apple-Mate." I was attracted by the price of $335 each, considerably less than the $545 Apple wants for their second drive. Also, the drive can half-track, an Apple drive feature used by many software protection schemes. Quentin drives are advertised as compatible with the standard Apple Disk II interface card, and 40-track operation is possible.

After using two Quentin drives for a few days, I must say I was disappointed. I was getting those dreaded DISK I/O ERROR messages. Was there a worm in the drives?

I gathered them up and headed for my testing lab at the local Apple dealership, where the dealer has been kind enough to let me use his facilities whenever I have a problem. He exudes great glee when any of my non-Apple equipment starts to hiccup and was not disappointed this time either. He even had a suggestion for a cure—buy a Disk II.

The first test was to try some game software. Several packages would not load, and one program would load on one drive but not the other. With an Apple drive there was no problem.

Next I tried Muffin and disk verify using FI. I got a disk I/O error on about 40 percent of the standard Apple disks I tried. In all cases these same disks could be verified by the Apple II standard drive.

"Was there a worm in the drives?"

I cleaned the heads and checked the speed, but another try gave the same results. Then I took a look at the boxes in which the drives were shipped.

The styrofoam that held the drives in place had broken out of the boxes. The drives had probably sustained a heavy blow that disrupted the mechanical alignment.

At this point I checked the fine print in the warranty and was surprised to find no terms or conditions stated. In a cold sweat I called Quentin to see if I had bought a pig in a poke.

[*According to the manufacturer, effective December 15, 1982, packaging technique of all Quentin products, including Apple-Mate, has been modified to reduce risk of damage during shipment. In addition, the terms and conditions of the warranty will be more precisely defined in user manuals.—eds.*]

They assured me there was a one-year parts and labor warranty on the drives. I should send them back for repair. Yes, they had had some shipping damage problems with their packaging. So I boxed up the drives in what was left of the packaging and sent them off.

A week later I was surprised to receive two new drives in the mail. I've tried all the same tests and software packages that gave the previous drives trouble. The new drives have behaved perfectly—even with very heavy use.

The unit appearance is very close to the Disk II. The only difference is the Quentin label. Also, there is no way to ground the shield on the attached cable at the computer end.

A neat mechanical lock prevents closing the door until the disk is all the way in—a good feature to have around hurried kids and Dads. The drive is based on a Siemens unit that uses a lead screen head positioner. The noise level is very low—a satisfying "whirrr" when in use.

The instructions consist of two photocopied sheets that tell you how to connect the drive to the interface card. Quentin provides three patches to DOS 3.3 that allow 40-track operation. The extra five tracks give you 80

Address correspondence to Lee E. Sumner, Jr., 75 E. King St., Dallastown, PA 17313.

more sectors in a disk. These patches make FID return the correct free space for 40 tracks. However, be careful. The patched DOS does not check for 35- or 40-track disks, and you must never write to a 35-track disk with this patched DOS in memory.

I have some experience with Micro-Sci 40-track drives. They provide a patch that looks at the disk before it is written to and keeps track of how many tracks are on the disk. I tried the Micro-Sci modified DOS and it worked fine with the Quentin drives.

The Quentin drive is a possible substitute for the Apple Disk II. The unit is well made and works. However, packaging is also part of the product. Quentin says they are trying to get out of the mail-order business and sell only through dealers. If you can get it that way, the Apple-Mate drive is a bargain. ■

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WRITE**	44.6 sec.	14.9 sec.

* Hi-res screen ‡ 80-sector BASIC program
** 52-sector random access text file

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A Drive of a (slightly) Different Color

Everything costs something—decide for yourself whether Micro-Sci's A-40 disk system will meet your needs.

by Lee E. Sumner, Jr.

A number of aftermarket disk systems are popping up as an alternative to the drives sold by Apple. I saw advertisements for the Micro-Sci A-40 drive and controller about $200 cheaper (from a discount house) than the Apple drive and controller. List prices from Micro-Sci are: $549 with controller for the 40 track A-40, and $699 for the 70 track A-70. The A-40 and A-70 bare drives are $449 and $599, respectively. Many mail-order houses offer the system at a considerable discount. I bit, and bought an A-40 drive and controller.

The drive and controller arrived in a sturdy foam box, well protected. The manual gives step by step instructions for installing the controller and drive.

The controller card has a jumper with three settings. One is for a self test done before connecting the drive to the controller card. When the Apple is turned on and an IN#6 command given, a message prints on the screen signifying the controller card is OK. The manual offers a troubleshooting guide in case you run into problems. I had none at all. I did have some questions that were answered promptly in a phone call to Micro-Sci. They support what they sell.

The other two positions of the jumper select the DOS (Disk Operating System) of your choice. Apple has two in common use, DOS 3.2 and DOS 3.3. You can attach a switch to the jumper pins and switch between the operating systems.

Micro-Sci does not supply the DOS. The manual says you must obtain that "elsewhere." They cannot sell the DOS because Apple owns it. Almost any unprotected piece of software contains Apple DOS. However, you miss all the neat utilities on the Apple DOS master disk. You can buy the master disk and DOS manual in the DOS 3.3 upgrade package from Apple ($70). You can also obtain the DOS by joining A.P.P.L.E. (which all Apple users should consider) and buying some of their great utilities, which all include DOS. The Apple DOS manual is sold separately for $10, and you absolutely cannot get along without this reference.

OK, we're over that hurdle and now have the DOS. The manual gives detailed instructions on checking out the system using the standard DOS. You could stop right here and use the system as a standard Apple drive. But to use the advantages of the system (5 msec track access time vs 18 msec and 40 tracks vs 35 tracks) you must modify the DOS using the utility disk that Micro-Sci supplies with the system. The extra tracks result in another 21K bytes of storage space on the disk. This is done once to create your own 40 track, fast-seek master disk, from which all future copies are made.

The manual supplies step-by-step instructions on modifying your system. The utility disk contains quite a bit of reading material, as well as programs to walk the user through the modification of DOS 3.2, 3.3, CP/M or Pascal to use the drives' features. These changes are all transparent to the user. The modified DOS can create 35, 40 or 70 track disks. The 35 track disks can be read and written to by standard Apple DOS. I had no trouble creating disks for the standard Apple machine, although some utility programs assumed a 35 track environment and caused some problems. In most cases I was able to get around this. With more and more 40 track drives on the market, I hope that utility writers make their software adapt to the number of tracks on the disk.

Micro-Sci also sells a 70 track version of this drive, called the A-70. This plugs into the same controller as the A-40. This drive has twice the storage capacity of the standard Apple drive, and the modified DOS recognizes any combination of 35, 40 and 70 track disks and drives.

In fact, you can use any combination of Apple and Micro-Sci A-40 and A-70 drives. This could be a big advantage where a lot of data is to be stored. Two A-70 drives give over a half mega-

---

Address correspondence to Lee E. Sumner, Jr., 75 E. King St., Dallastown, PA 17313.

byte of on-line storage, equivalent to four Apple drives. A-70 drives can read 35 and 40 track disks, but cannot write to them. Micro-Sci drives cannot be used on the Apple controller card, and Apple drives cannot be used on the Micro-Sci controller.

Included in the utilities supplied by Micro-Sci are modifiers for the Apple utility programs FID (File Developer) and Copy for supporting 35, 40 and 70 track drives. The Hello program on the master disk is also modified to indicate what DOS and stepping speed are being loaded at boot time. The Hello modifications are in Basic and are simple to use in your own Hello programs.

I have never had any trouble reading or writing any disk intended for use on a standard Apple drive, except for one type of protection scheme which I will mention later. You do have to keep track of the number of tracks on the disk and the stepping rate of the DOS. I solved that by writing needed information on the disk's label.

To use the extra disk space on the A-70 with VisiCalc, VisiDex, VisiTrend and VisiPlot, Micro-Sci supplies utilities to transfer these programs to 70 track disks. This could be a big help to users of very large VisiCalc templates.

Two more utilities will tell you how many tracks are on an unknown disk and also inform you as to your drive speed, with instructions as to how to set the correct speed if necessary.

After seven months of use, I have found only one limitation, that being that this drive will not "half-track." There are a good many games written that use half-tracking as protection against software piracy.

All is not lost, however. Micro-Sci will change the game to a format that the A-40 can read, and the software is still copy-protected. Nibble copy programs will now work on the A-40 system when trying to copy half-track programs.

I found that after long sessions at the computer I became a little annoyed by the racket made by the stepper motor for the drive head, which is quite noisy when compared to the Apple drive. For a $200 savings, though, I can live with it. The extra disk space made available has come in handy, as has the $200. ■

Screen Shepherd

Pascal cursor control—simplicity itself with a little prompting from a fellow who knows how.

by David L. Kutzler

It's good programming practice to precede any keyboard input operation with an appropriate screen prompt. One way is to print a new prompt on the screen before each keyboard input operation. A less distracting method is to generate "boiler plate" prompts. A boiler plate prompt might look like Figure 1.

The idea is to print the entire prompt on the screen and then have the cursor jump from prompt to prompt as the data is entered from the keyboard. A real advantage of boiler plate prompts is that the user can view an entire record on the screen while entering data. A simple boiler plate prompt, such as the one in Figure 1, is easily generated with only a few WriteLn statements. More complicated boiler plate prompts may take many lines of code to generate. Fewer lines of code are required to generate a complicated boiler plate prompt if the programmer has flexibility in cursor position. This article offers a group of Pascal functions, in the form of an intrinsic unit, which give the user finer control over cursor positioning on the screen.

> **"A real advantage of boiler plate prompts is that the user can view an entire record on the screen while entering data."**

```
           Acme Boiler Company, Inc.
         "We make our competitors boil"
Model [   /   /   ]       Series [            ]
Use category [      ]     Number [            ]
Date of Manufacture [          /       /      ]
Maximum safe pressure (PSI) [                 ]
```

Figure 1. An example of boiler plate prompting.

Understanding the Pascal Screen Driver

When a Pascal program outputs something, it calls on a part of the Pascal Operating System called the Basic Input Output System (BIOS). BIOS acts as the intermediary between the program and a group of machine-language routines called device drivers. The device drivers provide the software interface between the Pascal Operating System and peripheral devices such as monitors, printers, modems, etc. If BIOS is directed by the program to output something to the screen, it passes the output to a machine-language routine called the screen driver. The screen, like the printer, is a character-oriented device—i.e., it consumes a stream of ASCII characters.

The screen driver accepts ASCII characters from BIOS, and modifies the screen display in some way. This depends on what character is received. Most often, this means that the character representing the ASCII code it received is displayed on the screen, and the cursor moves to the next space. Characters like the letter A, the digit 6 and the symbol $, can be displayed on the screen and are called printable characters. Not every ASCII character can be displayed on the screen. ASCII codes 0–31 are control characters that cannot be displayed on the screen, and are called nonprintable characters. If a nonprintable character is passed to the screen driver, it either ignores the character or carries out a special action. The nonprintable ASCII characters have been assigned special definitions. ASCII character 8, (BS) is defined as a backspace. If this character is passed to the screen driver, the cursor moves one space backwards. Table

---

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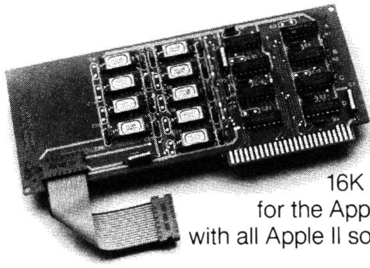

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"The code writes two prompts on the screen...it's simple and does the job."

1 lists the nonprintable characters and the action each one causes the screen driver to take.

Sometimes the action caused by a nonprintable character does not match the standard definition for the character. For example, one would expect ASCII character 9 (HT for Horizontal Tabulation) to move the cursor forward. Instead, ASCII character 9 is ignored by the screen driver. To move the cursor forward, ASCII character 28 (FS, for File Separator) must be passed to the screen driver.

By a similar quirk, ASCII character 11 (VT, for Vertical Tabulation) does not cause the cursor to move up. Sending ASCII character 11 to the screen driver will cause some very bizarre and unpredictable things to happen. What happens seems to depend on what follows the character. Most often, ten blanks will be sent to the screen and the next character passed to the screen driver will be sent to the Twilight

Program listing 1. Cursor, a Pascal unit for controlling cursor and screen display.

```
{$S+}           { Must use "Swapping" option to compile units. }

Unit Cursor;

Intrinsic Code 17
        Data 18;  { A data segment is generated. }

{=========================================================================}
{                                                                         }
{ "Cursor" is a unit of functions which are used to control the cursor and }
{ screen display.  Since they are all functions, they may be used inside a }
{ Write or WriteLn statement.  For example, the following instruction:    }
{                                                                         }
{      WriteLn(Clear,At(5,5),<variable1>,Skip(3),<variable2>);            }
{                                                                         }
{ will clear the screen, print <variable1> at screen coordinates (5,5),   }
{ do three carriage returns and print <variable2>.                        }
{                                                                         }
{ A Peek function and Poke procedure are provided and operate exactly like }
{ the PEEK and POKE statements in BASIC.                                  }
{                                                                         }
{=========================================================================}

Interface

Function  Peek(address:  integer): integer;
Procedure Poke(address,value:  integer);
```

Listing continued.

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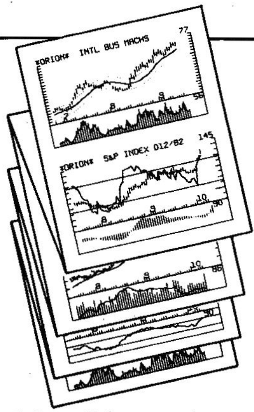

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Listing continued.

```
Function  CursorX:  integer;
Function  CursorY:  integer;
Function  Home:   char;
Function  Clear:  char;
Function  Down(lines:  integer):  char;
Function  Up(lines:  integer):  char;
Function  Right(columns:  integer):  char;
Function  Left(columns:  integer):  char;
Function  Skip(lines:  integer):  char;
Function  At(X,Y:  integer):  char;
Function  Tab(column:  integer):  char;
Function  Center(thread:  string):  char;
Function  Beep:  char;

Implementation

Type

 trick = Packed Array[0..1] of 0..255;

Var      { Used by Peek, Poke. }

 magic:  Record
          Case Boolean of
           FALSE:  (location:  integer);
           TRUE:   (pointer:  ↑trick)
         end;

{==========================================================================}
{                                                                          }
{ "Peek" is an integer function which will read and return the decimal value }
{ 0..255 stored at the decimal memory location taken as an argument.       }
{                                                                          }
{==========================================================================}

Function Peek;
Begin
 With magic do begin
  location := address;
  Peek := pointer↑[0];
 end;
end;

{==========================================================================}
{                                                                          }
{ "Poke" is a procedure which will write a decimal value 0..255 to a       }
{ specified decimal memory location.                                       }
{                                                                          }
{==========================================================================}

Procedure Poke;

Begin
 With magic do begin
  location := address;
  pointer↑[0] := value;
 end;
end;

{==========================================================================}
{                                                                          }
{ "CursorX" is an integer function which will return the X coordinate of   }
{ the current cursor location.  This only works if a Videx 80 column board }
{ is in Apple peripheral slot #3.  If the Videx board must be in a different }
{ slot than #3, then change the value of the constant "slot" to the number  }
{ of the Apple peripheral slot which the board occupies.  If you are using  }
{ the standard Apple screen with no 80 column card, change slot to 0 and    }
{ "place" to 244.  If you are using an 80 column board other than a Videx or }
{ are using an external monitor, consult your manuals for the decimal memory }
{ location of the X coordinate.                                            }
{                                                                          }
{==========================================================================}

Function CursorX;

Const

 slot  = 3;
 place = 1400;

Begin
 CursorX := Peek(place + slot)  { Memory location of cursor X coordinate. }
end;
```

Listing continued.

Zone. ASCII character 30 (RS for Record Separator) also causes bizarre screen occurrences. ASCII character 31, (US, which stands for Unit Separator) causes the screen driver to move the cursor up one line in the same column.

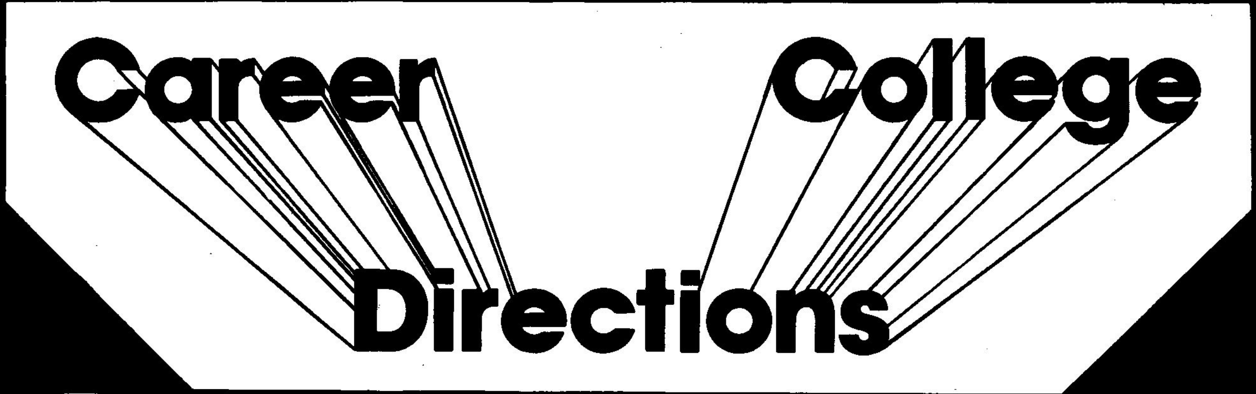
Another quirk is the way that ASCII character 13 (CR, for Carriage Return) is handled. By strict definition, a carriage return means that the cursor is to be returned to the leftmost column of the *current* line. However, if a carriage return is sent to the screen driver from a Pascal program, it causes the cursor to move to the leftmost column of the *next* line. This anomaly isn't caused by the screen driver itself. Whenever BIOS sends a carriage return to a character-oriented device, it will automatically send a linefeed character (ASCII 10) immediately afterwards.

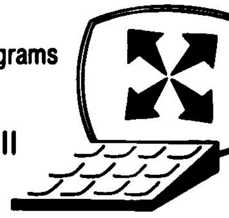
There is a good reason for this, for if such were not done, all output would be printed on one line. Sometimes this

Listing continued.

```
{==========================================================================}
{                                                                          }
{ "CursorY" is an integer function which will return the Y coordinate of   }
{ the current cursor location.  This only works if a Videx 80 column board }
{ is in Apple peripheral slot #3.  If the Videx board must be in a different }
{ slot than #3, then change the value of the constant "slot" to the number }
{ of the Apple peripheral slot which the board occupies.  If you are using }
{ the standard Apple screen with no 80 column card, change slot to 0 and   }
{ "place" to 245.  If you are using an 80 column board other than a Videx or }
{ are using an external monitor, consult your manuals for the decimal memory }
{ location of the Y coordinate.                                            }
{                                                                          }
{==========================================================================}

Function CursorY;

Const

 slot  = 3;
 place = 1528;

Begin
 CursorY := Peek(place + slot)  { Memory location of cursor Y coordinate. }
end;

{==========================================================================}
{                                                                          }
{ "Home" is used to move the cursor to the upper left corner of the screen }
{ without clearing the screen.                                             }
{                                                                          }
{==========================================================================}
```

Listing continued.





> **“Sometimes the action caused by a nonprintable character does not match the standard definition for the character.”**

Listing continued.

```
Function Home;

Begin
 Home := Chr(25)
end;

{============================================================================}
{                                                                            }
{ "Clear" is used to clear the screen.                                       }
{                                                                            }
{============================================================================}

Function Clear;

Begin
 Clear := Chr(12)
end;

{============================================================================}
{                                                                            }
{ "Down" is used to move the cursor down a given number of lines on the      }
{ screen.                                                                    }
{                                                                            }
{============================================================================}

Function Down;

Var

 index:  integer;

Begin
 If lines < 1 then lines := 1;                 { Correct any bad values. }
 For index := 1 to lines do Write(Chr(10));    { Move cursor down. }
 Down := Chr(0)                                { Return a "dummy" value. }
end;

{============================================================================}
{                                                                            }
{ "Up" is used to move the cursor up a given number of lines on the screen.  }
{                                                                            }
{============================================================================}

Function Up;

Var

 index:  integer;

Begin
 If lines < 1 then lines := 1;                 { Correct any bad values. }
 For index := 1 to lines do Write(Chr(31));    { Move cursor up. }
 Up := Chr(0)                                  { Return a "dummy" value. }
end;

{============================================================================}
{                                                                            }
{ "Right" is used to move the cursor a given number of columns to the right. }
{                                                                            }
{============================================================================}

Function Right;

Var

 index:  integer;

Begin
 If columns < 1 then columns := 1;             { Correct any bad values. }
 For index := 1 to columns do Write(Chr(28));  { Move the cursor. }
 Right := Chr(0)                               { Return a "dummy" value. }
end;

{============================================================================}
{                                                                            }
{ "Left" is used to move the cursor a given number of columns to the left.   }
```

Listing continued.

causes a problem if you are sending characters to a printer, as some printers generate a linefeed of their own whenever they receive a carriage return. The printer-generated linefeed, plus the one generated by BIOS, will cause the printer to double space or even fail to operate. If you have a problem, refer to pages 214–215 of your *Apple Pascal Operating System Reference Manual.*

The screen driver must always know the location of the cursor on the screen. It stores the current X and Y cursor coordinates in memory locations 244 and 245 ($00F4 and $00F5) respectively. This applies to Apple II Pascal version 1.1 only. It does not apply to Apple III Pascal, and may not apply to future releases of Apple II Pascal. Furthermore, the addition of certain peripheral equipment to the Apple II may change these locations. Putting a Videx 80-column board in expansion slot #3 of your Apple II will cause the X coordinate to be stored at memory location 1403 ($057B), and the Y coordinate to be stored in memory location 1531 ($05FB).

Communicating With the Screen Driver

Standard Pascal statements cause the screen driver to carry out some of the actions described above. WriteLn; will send a carriage return to the screen driver. Page(output); will cause the screen driver to clear the screen and position the cursor at screen location (0,0). GotoXY(X,Y); will cause the screen driver to position the cursor at screen location (X,Y). These statements are simple to use, but can result in ponderous and redundant code. Consider the following code segment:

```
WriteLn(prompt1);
WriteLn;
WriteLn;
WriteLn;
WriteLn(prompt2);
```

The code writes two prompts on the screen, separated by three blank lines. It's simple and does the job, but it's redundant. Compare it to the following line of code:

```
WriteLn(prompt1,Chr(13),Chr(13),Chr(13),
prompt2);
```

This does the same thing as the five lines of code in the previous example.

Listing continued.

```
{                                                                           }
{===========================================================================}

Function Left;

Var

 index:  integer;

Begin
 If columns < 1 then columns := 1;              { Correct any bad values. }
 For index := 1 to columns do Write(Chr(8));    { Move the cursor. }
 Left := Chr(0)                                 { Return a "dummy" value. }
end;

{===========================================================================}
{                                                                           }
{ "Skip" is used to skip a given number of lines.                           }
{                                                                           }
{===========================================================================}

Function Skip;

Var

 index:  integer;

Begin
 If lines < 1 then lines := 1;                { Correct any bad values. }
 For index := 1 to lines do Write(Chr(13));   { Skip some lines.        }
```

Listing continued.

The difference is that the standard Pascal function Chr(13) was used to cause the carriage returns rather than three WriteLn statements. The Chr function returns the ASCII character whose ordinal value 0–127 is passed to it as an argument. Chr even returns nonprintable characters. Since it is a function, Chr may appear in a Write or WriteLn statement just like any other write parameter, and the character which it returns will be sent to the screen driver. The Chr function provides us with a convenient mechanism for passing special control characters to the screen driver.

The second version of the example code is still redundant because Chr(13) must be written three times. A better approach would be to write a function which could send any number of carriage returns to the screen driver. Such a function appears below:

```
Function Skip(lines: integer): char;
Var
```

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†60 lines per page, random line lengths, 40 char/line. Assumes CPU can output text at a minimum of 3000 char/sec.

Listing continued.

```
 Skip := Chr(0)                                  { Return a "dummy" value. }
end;

{============================================================================}
{                                                                            }
{ "At" allows the user to position the cursor anywhere on the screen.        }
{                                                                            }
{============================================================================}

Function At;

Begin
 If X < 0 then X := 0;      { Correct any bad values. }
 If Y < 0 then Y := 0;
 If X > 79 then X := 79;
 If Y > 23 then Y := 23;
 GotoXY(X,Y);               { Position the cursor at location (X,Y). }
 At := Chr(0)               { Return a "dummy" value.                }
end;

{============================================================================}
{                                                                            }
{ "Tab" allows the user to position the cursor on any column 0..79 of the    }
{ current line.  This function is particularly useful when printing tabular  }
{ columns of numbers.                                                        }
{                                                                            }
{============================================================================}

Function Tab;

Begin
 If column < 0 then column := 0;    { Correct any bad values.             }
 If column > 79 then column := 79;
 GotoXY(column,CursorY);            { Move cursor to the correct column.  }
 Tab := Chr(0)                      { Return a "dummy" value.             }
end;

{============================================================================}
{                                                                            }
{ "Center" prints a string so that it is centered on the current line.  If   }
{ you are using a standard Apple 40 column display, change the value of the  }
{ constant "middle" to 19.                                                   }
{                                                                            }
{============================================================================}

Function Center;

Const

 middle = 39;

Var

 offset:  integer;

Begin
 offset := middle - (Length(thread) DIV 2);    { Calculate the offset.   }
 Write(Tab(offset),thread);                    { Tab and Write string.   }
 Center := Chr(0)                              { Return a "dummy" value. }
end;

{============================================================================}
{                                                                            }
{ "Beep" is used to sound the Apple ][ speaker from inside a Write or        }
{ WriteLn statement.                                                         }
{                                                                            }
{============================================================================}

Function Beep;

Begin
 Beep := Chr(7)
end;


Begin  { Initialize the unit. }
end.
```

```
  index: integer;
Begin
  If Lines<1 then lines : = 1;
  For index : = 1 to lines do Write(Chr(13));
  Skip : = Chr(0)
end;
```

The Skip function is clear but the last line may need more explanation. A function must return a scalar value of some sort. If a function appears in a Write or WriteLn statement, the value it returns is output to the screen. The purpose of the Skip function is to send a specified number of carriage returns to the screen, not to output a value to the screen.

The point of using a function rather than a procedure is that a function can appear inside a Write or WriteLn statement while a procedure cannot. The trick is to prevent the returned value from messing up the screen after the function has done its job. You do this by taking advantage of the fact that certain nonprintable characters will be ignored by the screen driver. The function is declared to be of type "char," and is then assigned ASCII character 0 (NULL), which is passed to the screen driver and thereafter ignored. Rewrite the example code with the Skip function as follows:

```
WriteLn(prompt1,Skip(3),prompt2);
```

Note the simplicity and economy of this version of the code when compared to the original five-line version. In certain applications, the Skip function can save the programmer many lines of redundant code.

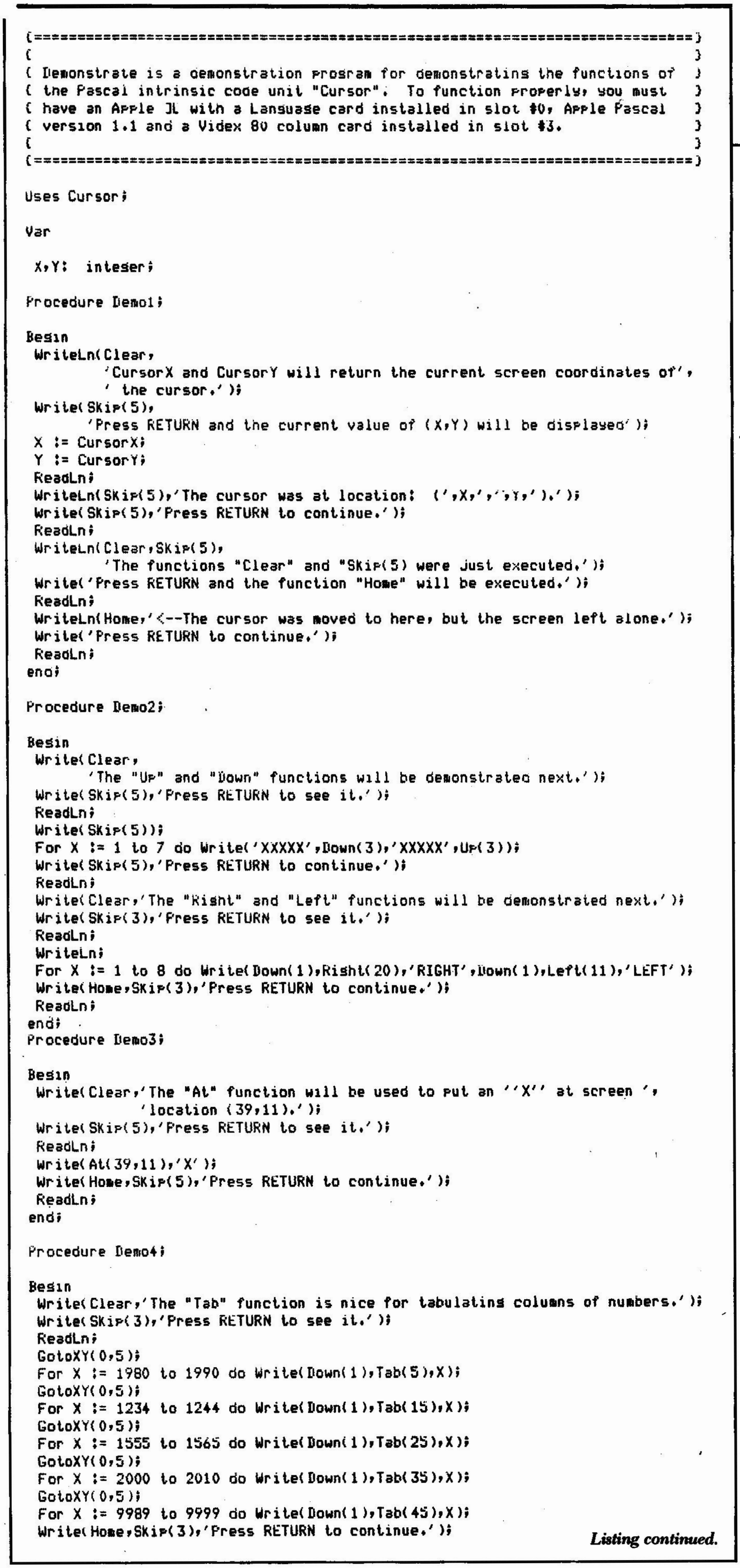
A similar and perhaps more useful function is the At function, which is similar to the GotoXY statement except that it's more convenient. Consider the following code segment:

```
GotoXY(39,5);
WriteLn(prompt1);
GotoXY(39,6);
WriteLn(prompt1);
```

Note that a separate statement must be used for each cursor positioning and write operation. It would be simpler if the cursor positioning could be done inside a Write or WriteLn statement. The At function accomplishes this as follows:

```
Function At(X,Y: integer): char;
Begin
```

Program listing 2.
Demonstrate, a program for demonstrating the functions of the Pascal intrinsic code unit Cursor.



```
{==========================================================================}
{                                                                          }
{ Demonstrate is a demonstration program for demonstrating the functions of }
{ the Pascal intrinsic code unit "Cursor".  To function properly, you must  }
{ have an Apple ][ with a Language card installed in slot #0, Apple Pascal  }
{ version 1.1 and a Videx 80 column card installed in slot #3.             }
{                                                                          }
{==========================================================================}

Uses Cursor;

Var

 X,Y:  integer;

Procedure Demo1;

Begin
 WriteLn(Clear,
        'CursorX and CursorY will return the current screen coordinates of',
        ' the cursor.');
 Write(Skip(5),
      'Press RETURN and the current value of (X,Y) will be displayed');
 X := CursorX;
 Y := CursorY;
 ReadLn;
 WriteLn(Skip(5),'The cursor was at location:  (',X,',',Y,').');
 Write(Skip(5),'Press RETURN to continue.');
 ReadLn;
 WriteLn(Clear,Skip(5),
        'The functions "Clear" and "Skip(5) were just executed.');
 Write('Press RETURN and the function "Home" will be executed.');
 ReadLn;
 WriteLn(Home,'<--The cursor was moved to here, but the screen left alone.');
 Write('Press RETURN to continue.');
 ReadLn;
end;

Procedure Demo2;

Begin
 Write(Clear,
      'The "Up" and "Down" functions will be demonstrated next.');
 Write(Skip(5),'Press RETURN to see it.');
 ReadLn;
 Write(Skip(5));
 For X := 1 to 7 do Write('XXXXX',Down(3),'XXXXX',Up(3));
 Write(Skip(5),'Press RETURN to continue.');
 ReadLn;
 Write(Clear,'The "Right" and "Left" functions will be demonstrated next.');
 Write(Skip(3),'Press RETURN to see it.');
 ReadLn;
 WriteLn;
 For X := 1 to 8 do Write(Down(1),Right(20),'RIGHT',Down(1),Left(11),'LEFT');
 Write(Home,Skip(3),'Press RETURN to continue.');
 ReadLn;
end;
Procedure Demo3;

Begin
 Write(Clear,'The "At" function will be used to put an ''X'' at screen ',
           'location (39,11).');
 Write(Skip(5),'Press RETURN to see it.');
 ReadLn;
 Write(At(39,11),'X');
 Write(Home,Skip(5),'Press RETURN to continue.');
 ReadLn;
end;

Procedure Demo4;

Begin
 Write(Clear,'The "Tab" function is nice for tabulating columns of numbers.');
 Write(Skip(3),'Press RETURN to see it.');
 ReadLn;
 GotoXY(0,5);
 For X := 1980 to 1990 do Write(Down(1),Tab(5),X);
 GotoXY(0,5);
 For X := 1234 to 1244 do Write(Down(1),Tab(15),X);
 GotoXY(0,5);
 For X := 1555 to 1565 do Write(Down(1),Tab(25),X);
 GotoXY(0,5);
 For X := 2000 to 2010 do Write(Down(1),Tab(35),X);
 GotoXY(0,5);
 For X := 9989 to 9999 do Write(Down(1),Tab(45),X);
 Write(Home,Skip(3),'Press RETURN to continue.');
```

Listing continued.

```
  If X<0 then X : = 0;
  If Y<0 then Y : = 0;
  If X>79 then X : = 79;
  If Y>23 then Y : = 23;
  GotoXY(X,Y);
  At : = Chr(0)
end;
```

The previous code segment can now be simplified as follows:

`WriteLn(At(39,5),prompt1,At(39,6),prompt2);`

Note the economy and elegance of this single line of code compared to the four lines it replaces.

A Bag of Tricks

The Skip and At functions are included in an intrinsic unit called Cursor (refer to Listing 1). Several other useful cursor and screen control functions are included in the unit and are briefly described in the paragraphs which follow.

The first two routines in Cursor are a Peek function and a Poke procedure. These routines operate exactly like the Peek and Poke routines in Applesoft Basic. The Peek function is included with the unit because some of the other functions must examine the contents of memory locations. The Poke procedure is not used by any of the other functions, but is included with the unit for completeness. Use the Poke procedure at your own risk. A careless Poke can cause the entire Pascal Operating System to crash in such a way that only a cold boot will recover it.

The CursorX and CursorY functions are integer functions which respectively return the current X and Y screen coordinates of the cursor. The following is an example of the CursorX and CursorY functions in use:

`WriteLn(prompt1,At(CursorX + 15,CursorY), prompt2);`

The Home function will move the cursor to the upper left corner of the screen, but will not otherwise disturb the screen display. The Clear function will move the cursor to the upper left corner of the screen but will erase the screen. Here is an example of these two functions:

`WriteLn(Clear,Skip(5),prompt1,Skip(5), prompt2,Home,'Are you ready? ');`

The Up and Down functions move the cursor a specified number of lines above or below its current position. If the cursor "bumps" into the bottom of

Listing continued.

```
  ReadLn;
 end;

 Procedure Demo5;

 Begin
  Write(Clear,'The "Center" function is nice for making title headings.');
  Write(Skip(3),'Press RETURN to see it.');
  ReadLn;
  Write(Clear,Skip(5),
        Center('Pascal Cursor Control!'),Skip(2),
        Center('How to Gain Control of Your'),Skip(2),
        Center('Life and Programs.'),Home,
        'Press RETURN to terminate program.');
   ReadLn;
 end;

 Begin
  Write(Clear,Skip(5),Center('Pascal Cursor Control'),
              Skip(5),Center('Press RETURN to continue'));
  ReadLn;
  Demo1;
  Demo2;
  Demo3;
  Demo4;
  Demo5
 end.
```

Number	Character	Definition	Screen action
0	NUL	Null	Ignored
1	SOH	Start of heading	Ignored
2	STX	Start of text	Ignored
3	ETX	End of text	Ignored
4	EOT	End of transmission	Ignored
5	ENQ	Enquiry	Ignored
6	ACK	Acknowledge	Ignored
7	BEL	Bell	Sound speaker
8	BS	Backspace	Backspace
9	HT	Horizontal tabulation	Ignored
10	LF	Linefeed	Linefeed
11	VT	Vertical tabulation	Erase to end of screen
12	FF	Form feed	Clear screen, cursor to (0,0)
13	CR	Carriage return	Cursor to column 0 of next line
14	SO	Shift out	Ignored
15	SI	Shift in	Ignored
16	DLE	Data link escape	Bizarre, unpredictable effects
17	DC1	Device control 1	Ignored
18	DC2	Device control 2	Ignored
19	DC3	Device control 3	Ignored
20	DC4	Device control 4	Ignored
21	NAK	Negative acknowledge	Ignored
22	SYN	Synchronous idle	Ignored
23	ETB	End of transmission block	Ignored
24	CAN	Cancel	Ignored
25	EM	End of medium	Move cursor to (0,0)
26	SUB	Substitute	Ignored
27	ESC	Escape	Ignored
28	FS	File separator	Nondestructive forward space
29	GS	Group separator	Erase to end of line
30	RS	Record separator	Bizarre, unpredictable effects
31	US	Unit separator	Move cursor up one line.

Table 1. Summary of screen driver actions caused by nonprintable characters.

the screen while moving down, the screen will scroll up the appropriate number of lines. If the cursor bumps into the top of the screen while moving up, it will stop (i.e., the screen will not scroll down). Here is an example of the Up and Down functions:

WriteLn(Clear,Skip(12),'LOW',Down(5), 'LOWER',Up(9),'HIGH');

The Right and Left functions will move the cursor a specified number of spaces to the right or left of its current position. The functions are nondestructive—they will not disturb existing text on the screen. If the cursor bumps into the right margin while moving right, it will jump to column 0 of the next line even if the screen must scroll up to allow it. If the cursor bumps into the left margin while moving left, the cursor will jump to column 79 of the previous line unless it is at screen position (0,0), in which case it will remain in place. Here is an example of the Right and Left functions:

WriteLn(Clear,Right(20),'RIGHT',Left(15), 'LEFT');

The Tab function will position the cursor at a specified column 0–79 of the current line. This function is particularly useful when printing tabulated columns of numbers. Here is an example of the Tab function:

For index : = 10 to 25 do Write(Down(1), Tab(39),index);

The above line of code will print a column of numbers down the middle of the screen. The same task would require many lines of code if the Tab function were not used.

The Center function will center a string on the current line. Here is an example of the Center function:

WriteLn(Clear,Skip(6),Center('Pascal Cursor Control'));

The Beep function is a convenient way to sound the Apple speaker. This is useful when an audible cue is desired. Here is an example of the Beep function:

If error then Write(Home,Beep,'ERROR: Reenter Data-->');

How to Use Cursor

To use Cursor, type Listing 1 into your editor. Compile the text file and use the system librarian utility program to link the intrinsic code file into your System.Library (refer to pages 186–193 of the *Apple Pascal Operating System Reference Manual*). The unit may be invoked by placing the statement Uses Cursor; immediately after the Program <identifier>; statement in your Pascal host program (refer to pages 72–81 of the *Apple Pascal Language Reference Manual*). You will find many applications for these useful functions. ■

Graphing Growth with Pressure Curves

With this handy technique your Apple II will help you forecast business cycles.

by Richard Green

Program listing. Plotting pressure curves.

```
 LIST
0  REM * PRESSURE REVISITED *
1  REM * BY RICHARD GREEN *
2  REM * JULY 10, 1982 *
3  REM
4  REM
5  REM * CLEAR VARIABLES *
7  CLEAR : RESTORE : DIM A(60): DIM B(60): DIM C(60): DIM D(60)
10  HOME
15  REM * MAIN MENU *
20  PRINT
30  PRINT "########################################"
40  FOR X = 3 TO 20
50  VTAB X
60  PRINT "#"; SPC( 38);"#"
70  NEXT
80  VTAB 21
90  PRINT "########################################"
100  VTAB 3
110  PRINT : HTAB 4: PRINT "1) ENTER DATA"
120  PRINT : HTAB 4: PRINT "2) SAVE DATA"
130  PRINT : HTAB 4: PRINT "3) RAW DATA TABLE"
140  PRINT : HTAB 4: PRINT "4) 3MMA DATA TABLE"
150  PRINT : HTAB 4: PRINT "5) PRESSURE DATA TABLE"
160  PRINT : HTAB 4: PRINT "6) PLOT CURVE"
170  PRINT : HTAB 4: PRINT "7) PLOT BAR GRAPH"
175  PRINT : HTAB 4: PRINT "8) EDIT RAW DATA"
180  VTAB 23: HTAB 4: INPUT "ENTER NUMBER ";P
190  IF P = 1 THEN V = 0: GOTO 270
200  IF P = 2 THEN V = 0: GOTO 1420
210  IF P = 3 THEN V = 0: GOSUB 2000: GOSUB 610
215  IF P = 4 THEN V = 1: GOSUB 3000: GOSUB 610
218  IF P = 5 THEN V = 1: GOSUB 6050: GOSUB 610
220  IF P = 6 THEN Q = 1: GOTO 990
230  IF P = 7 THEN Q = 2: GOTO 990
235  IF P = 8 THEN 1800
240  GOTO 10
270  REM * DATA ENTRY MENU *
271  HOME
272  FOR X = 0 TO 60
274 A(X) = 0:B(X) = 0:C(X) = 0:D(X) = 0
276  NEXT X
280  PRINT
290  PRINT "DATA ENTRY": PRINT
300  INPUT "FROM KEYBOARD OR DISK? ";Q$
310  IF Q$ = "DISK" THEN  GOTO 1560
320  REM * KEYBOARD INPUT *
321  HOME
330  PRINT
340  INPUT "TITLE? ";W$
350  HOME : PRINT
360 B = 360
```

Listing continued.

Remember when our 4K Level I TRS-80s could outperform the most powerful mainframes? Well, at least in our *minds* they could. Why, we had our own Star Trek program and everything. Unfortunately, whenever someone would ask, "What does it do besides play games?" we were hard pressed to show any real practical use for our favorite toy.

The December 1978 issue of *Kilobaud* (now *Microcomputing*) magazine solved the problem of practicality for me. There on page 80 was a *real* business program written for a 4K Level I machine ("The Ups and Downs of Business," by Jim Wright). Mr. Wright's article describes the use of pressure curves to forecast business cycles.

A pressure curve, according to Wright, "is a graph of the ratio of sales (or any other variable) in a particular period compared to sales in some previous period." In other words, if you compare data for any month with the data for the same month a year ago, and plot the results, you will have a curve showing the rate of change of growth. You will be plotting a pressure curve. The method used in Wright's program is to first smooth the raw data

Address correspondence to Richard Green, PO Box 15157, Fresno, CA 93702.

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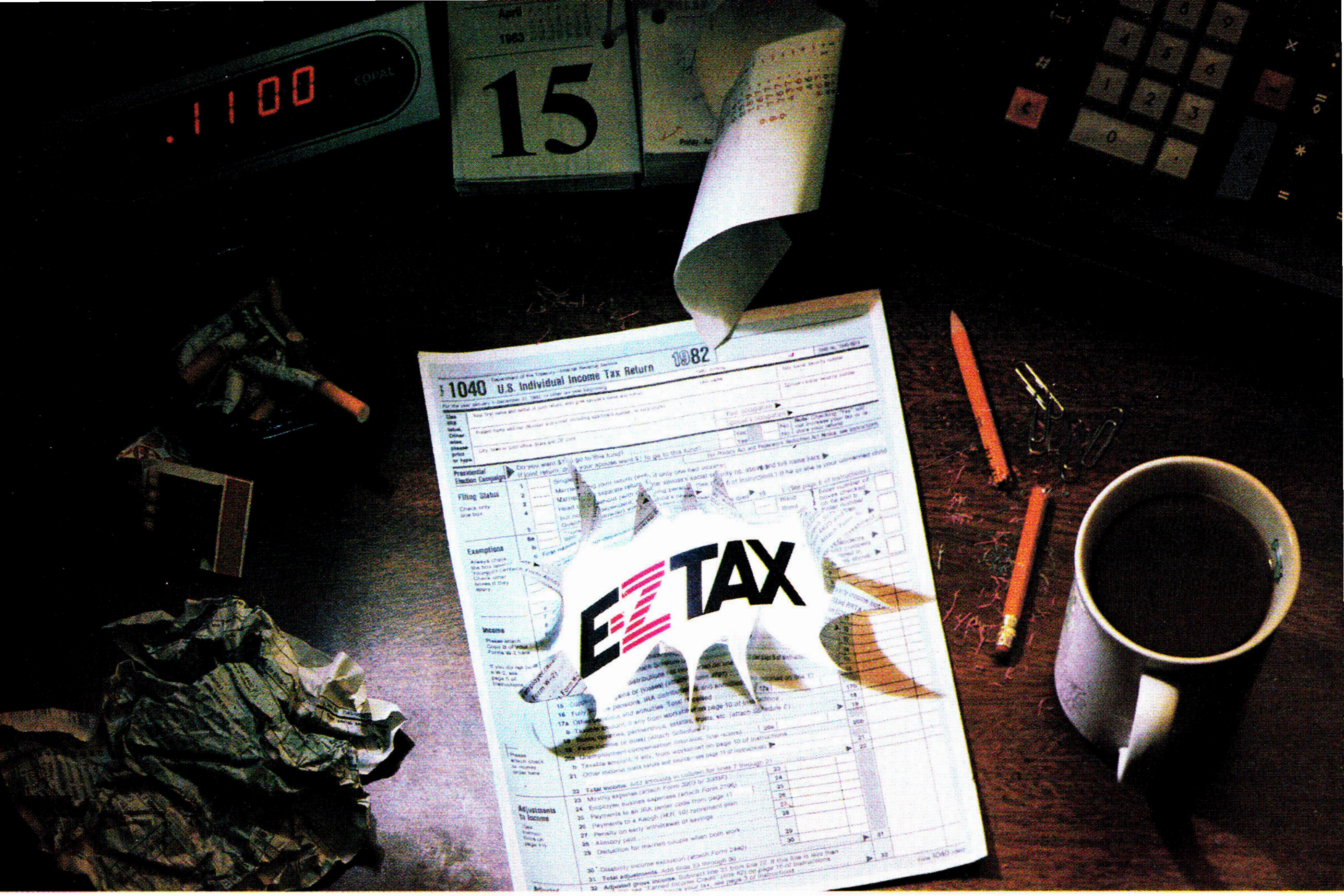

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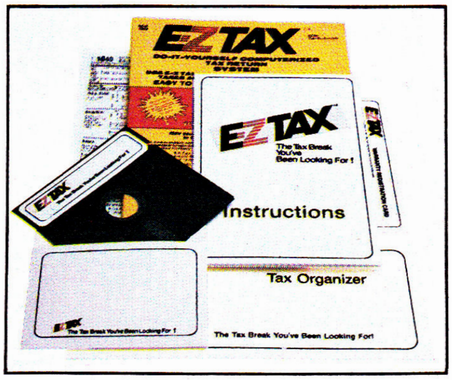

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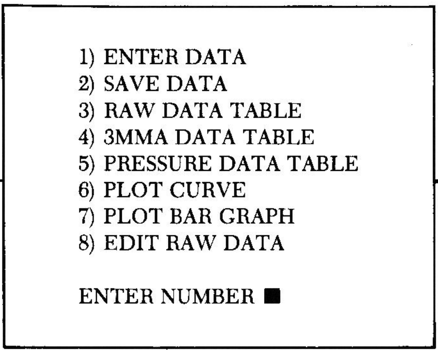
Listing continued.

```
370  INPUT "FIRST YEAR? ";E
380  PRINT
390  PRINT "NUMBER OF MONTHS"
400  INPUT "(MAX=60)   ";R
410  IF R > 60 THEN  HOME : GOTO 380
415  RESTORE
420  FOR T = 0 TO (R - 1)
430  HOME
440  PRINT
450 Y = 0
460 Y =  INT (T / 12)
470 I = E + Y
480  PRINT "DATA FOR "I
490  IF T = 12 THEN  RESTORE
500  IF T = 24 THEN  RESTORE
510  IF T = 36 THEN  RESTORE
520  IF T = 48 THEN  RESTORE
530  IF T = 60 THEN  RESTORE
540  PRINT
550  READ Z$
560  PRINT Z$;: INPUT Q
570 B(T) = Q
580  NEXT T
585  RESTORE
590  DATA JAN,FEB,MAR,APR,MAY,JUN,JUL,AUG,SEP,OCT,NOV,DEC
600  GOTO 10
610  REM  * DATA TABLE *
620 YEAR = E
630  HOME : RESTORE
640  PRINT
650  PRINT "DATA FOR ";W$
660  PRINT
670  FOR T = 6 TO 38 STEP 7
680  PRINT  TAB( T);YEAR;:YEAR = YEAR + 1: NEXT
690  PRINT : PRINT "   -----------------------------------"
700  FOR T = 1 TO 12
710  READ M$
720  PRINT M$;":"
730  NEXT
740 T = 7
750  FOR X = 0 TO 59 STEP 12
760  VTAB 7
770  FOR Z = 0 TO 11
780  HTAB T: PRINT A(Z + X)
790  NEXT Z
800 T = T + 7: NEXT X
805  REM * FIND MAX AND MIN *
810 U = A(0):W = 999999
820  FOR X = V TO R - (1 + V)
825  IF A(X) = 0 THEN 850
830  IF A(X) > U THEN U = A(X)
840  IF A(X) < W THEN W = A(X)
850  NEXT X
855  IF U = 0 THEN  FLASH : PRINT : PRINT "INSUFFICIENT DATA!": NORMAL : GOTO
     1360
857  REM * PRINT MAX AND MIN *
860  PRINT : PRINT : PRINT "MAX.=";U,: PRINT "MIN.= ";W
865  IF P = 5 THEN V = 13
870 FRMT = (150 / U) * .95
875  GOSUB 5000
880  PRINT
890  INPUT "PRESS RETURN TO CONTINUE";P$
900  RETURN
990  REM * GRAPHING ROUTINE *
991  HOME : GOSUB 1020
1000  IF Q = 1 GOTO 1180
1010  IF Q = 2 GOTO 1250
1020  HGR
1030  HCOLOR= 7
1040  HPLOT 5,5
1050  HPLOT  TO 5,155
1060  HPLOT  TO 245,155
1070  HPLOT  TO 245,5
1080  HPLOT  TO 5,5
1090  FOR A = 17 TO 245 STEP 12
1100  HPLOT A,155 TO A,157: NEXT
1110  FOR A = 5 TO 245 STEP 48
1120  HPLOT A,155 TO A,159: NEXT
1130  FOR A = 155 TO 5 STEP  - 7.5
1140  HPLOT 2,A TO 5,A: NEXT
1150  FOR A = 155 TO 5 STEP  - 15
1160  HPLOT 0,A TO 5,A: NEXT
1170  RETURN
1180  REM * LINE GRAPH *
1181 X = V
1185  HPLOT (5 + 4.1 * V),155 - (A(X) * FRMT)
1200  FOR A = (5 + 4.1 * V) TO 250 STEP 4.1
1210 B = A(X) * FRMT
1215  IF B = 0 THEN 1225
1220  HPLOT  TO A,155 - B
1225 X = X + 1: IF X = R THEN 1340
1230  NEXT
1240  GOTO 1340
1250  REM * BAR GRAPH *
1251 X = V
1260  FOR A = (7 + 4.1 * V) TO 250 STEP 4
1270 B = A(X) * FRMT
1275  IF B = 0 THEN 1310
1280  HPLOT A,155 - B TO A,155
1290  HPLOT A + 1,155 - B TO A + 1,155
1300  HPLOT A - 1,155 - B TO A - 1,155
1310 X = X + 1: IF X = R THEN 1340
1320  NEXT
1340  VTAB 21: PRINT "0 "; SPC( 5);"1 "; SPC( 5);"2 "; SPC( 5);"3 "; SPC(
     5);"4 "; SPC( 5);"5 "
```

Listing continued.



```
1) ENTER DATA
2) SAVE DATA
3) RAW DATA TABLE
4) 3MMA DATA TABLE
5) PRESSURE DATA TABLE
6) PLOT CURVE
7) PLOT BAR GRAPH
8) EDIT RAW DATA

ENTER NUMBER ■
```

Figure 1.
This program is menu driven. By selecting a number and pressing return, you can enter data, save data or display it as either tables or graphs.

by averaging it over a 12-month period and then finding its ratio to the 12-month average a year ago. Wright really goes into how this is done and why—I recommend his article if you can still find a copy.

After reading the article, I immediately entered the program into my TRS-80. Wow! I could make business projections just like the big boys. Was I ever proud. I couldn't wait for someone to ask the big question—I was ready. I had my own practical example of computing power.

Well, about this time I discovered the Apple II with its high-resolution graphics, color and sound. If I had an Apple, I was sure I could enter the world of big-time business computing. I just had to have one.

With just a little financial manipulation (mortgage the house, auction off the car, sell the kids into slavery), I was able to make my wish come true. Imagine my disappointment when I discovered that my favorite (and *only*) business program was not compatible with my shiny new Apple II.

Not only were the graphics not at all compatible (I wouldn't have expected them to be), but the Apple II was using an entirely different language. The Apple would not recognize commands like CLS, and I think I heard it snicker when I tried Level I shorthand commands like F.I=1TOE:GOS.95. It was beginning to look as though I would have to make a choice. Find another program, or rewrite this one.

I couldn't find another program.

In rewriting the program for my Apple II, I made a few changes to make it fit my system and my needs. The major changes are:

1. To accommodate the Apple's smaller 40-column screen width, I reduced the overall period from ten years to five years.
2. My memory was no longer limited to 4K so I didn't try to be highly efficient with my coding.
3. I now had a disk system to load and save my data, so I used disk commands instead of cassette tape commands as in the original program.
4. I use a three-month instead of a 12-month moving average to smooth my raw data. This gives me better resolution for individual months and quarters, which are the main periods of interest to me.
5. I've included an automatic scaling routine that calculates the maximum and minimum values of the data and adjusts the graph accordingly.
6. I take advantage of the Apple's high-resolution graphics, but not its color and sound. I thought of using different colors for different kinds of data but decided against it and use white only.

When you run the program, the main menu will appear on your screen. Item 1 (ENTER DATA) allows you to enter your data from the keyboard or from a disk. If you choose keyboard entry, you enter the title of your data, the first year of the series, and the number of months your data covers. You can then enter your data for each month, a month at a time. When the last month's data is entered, the program will return you to the main menu.

The data you just entered can be saved by choosing item 2 (SAVE

Listing continued.

```
1345  REM  * PRINT MAX AND MIN *
1347  IF U = 0 THEN  VTAB 22: GOTO 855
1350  VTAB 22: PRINT "MAX.=";U,"MIN.=";W
1360  POKE 34,23
1370  PRINT
1380  INPUT "PRESS RETURN TO CONTINUE";P$
1390  TEXT : GOTO 10
1400  TEXT
1410  HOME : END
1420  REM * DISK SAVE *
1421  HOME
1430 D$ = "": REM  CTRL-D
1440  PRINT D$"NOMONC,I,O": HOME
1450  PRINT D$;"OPEN";W$
1460  PRINT D$;"DELETE";W$
1470  PRINT D$;"OPEN";W$
1480  PRINT D$;"WRITE";W$
1490  PRINT (R - 1)
1500  PRINT E
1510  FOR X = 0 TO (R - 1)
1520  PRINT B(X)
1530  NEXT X
1540  PRINT D$"CLOSE";W$
1550  GOTO 10
1560  REM * DISK LOAD *
1570  PRINT
1580  INPUT "TITLE? ";W$
1590 D$ = "": REM  CTRL-D
1600  PRINT D$"NOMONC,I,O": HOME
1610  PRINT D$;"OPEN";W$
1620  PRINT D$;"READ";W$
1630  INPUT Q
1640  INPUT E
1650  FOR X = 0 TO Q
1660 R = Q + 1
1670  INPUT B(X)
1680  NEXT X
1690  PRINT D$;"CLOSE";W$
1691  GOSUB 2000
1695  GOSUB 610
1700  GOTO 10
1800  REM * EDIT DATA *
1810 V = 0: GOSUB 2000
1815  GOSUB 610
1820  POKE 34,20
1830  HOME
1840  PRINT "TYPE MONTH (1-12) , YEAR "
1845  PRINT "TYPE 0,0 TO RETURN TO MENU"
1850  INPUT M1,Y1
1855  IF M1 = 0 THEN  TEXT : GOTO 10
1857  IF Y1 < E OR Y1 > (E + 4) THEN 1900
1858  IF M1 < 0 OR M1 > 12 THEN 1900
1860 E2 = (M1 - 1) + (12 * (Y1 - E))
1870  HOME
1880  PRINT "CHANGE FROM:";A(E2)
1885  INPUT "TO :";ND
1890 A(E2) = ND
1895  IF E2 > (R - 1) THEN R = E2 + 1
1900  TEXT
1905  FOR RD = 0 TO 59:B(RD) = A(RD): NEXT
1910  GOTO 1800
2000  REM * GET RAW DATA *
2010  FOR RD = 0 TO 59:A(RD) = B(RD): NEXT
2020  RETURN
3000  REM * GET 3MMA DATA *
3010  FOR MA = 0 TO 59:A(MA) = C(MA): NEXT
3020  RETURN
5000  REM * CALCULATE 3MMA *
5010 Y = 1
5020  FOR X = 0 TO R - 3
5030 C(Y) =  INT ((B(X) + B(X + 1) + B(X + 2)) / 3)
5040 Y = Y + 1: NEXT
6000  REM * CALCULATE PRESSURE *
6010  FOR Y = 13 TO R
6020 D(Y) =  INT ( INT ((C(Y) / C(Y - 12)) * 1000) / 10)
6025  NEXT Y
6030  RETURN
6050  REM * GET PRESSURE DATA *
6060  FOR PR = 0 TO 59:A(PR) = D(PR): NEXT
6070  RETURN
]
```

DATA). It will be saved in a file using the name you specified when you originally entered it.

Item 3 (RAW DATA TABLE), item 4 (3MMA DATA TABLE) and item 5 (PRESSURE DATA TABLE) will all display data in tabular form as indicated. Item 6 (PLOT CURVE) and item 7 (PLOT BAR GRAPH) will draw a line graph or a bar graph of the last data table that was displayed.

Item 8 (EDIT RAW DATA) is used to add data on a month by month basis, or to correct errors.

Converting this program from its original shorthand Basic to Applesoft Basic was a much bigger project than I had anticipated. I learned a lot about programming and I think it was worth the effort. I've sprinkled the program listing liberally with REM statements to make it easier for you to follow (or rewrite). I hope the program is as useful to you as it is to me. ■

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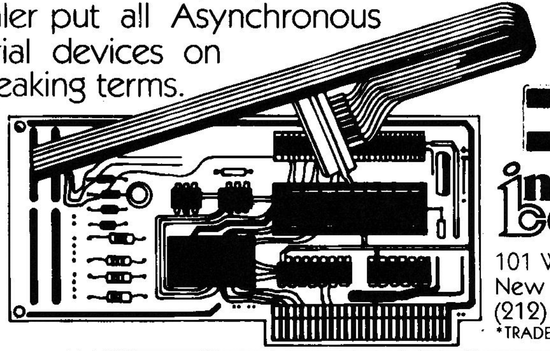

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```
xxx  PRINT "PLEASE ENTER THE DATE."; : & INPUT,DATE$
```

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Getting Higher on Graphics

Inadequate plots or charts driving you to a mainframe? Hold on. . . here's an assembly-language program you can call from Basic to simulate a hi-res screen with outstanding graphics.

by Paul Schubert

The Apple II computer connected with an inexpensive monochrome video monitor can produce graphic images on an array of 280 by 192 pixels. This capability serves many purposes including plotting graphs and creating animated games. I use my Apple primarily for scientific calculations, and so I value the ability to plot simple graphs of data or functions on the screen. Adding a graphics printer (in my case an Apple Silentype thermal printer) increases the utility of Apple graphics, since permanent records of plots and graphs are very often necessary. The inexpensive Silentype can print rather detailed images.

Sometimes, however, the Apple 280 × 192 display is inadequate. More pixels are needed to render intelligible a more detailed plot or chart. Not much can be done about the video screen (using only software). It is easy to write the software to "draw" images in a selected block of memory and subsequently print the finished result with a graphics printer. The inability to view the image before you print it out is a disadvantage, but not a severe one.

I allocated about 20,000 bytes of memory for a graphics storage area. This size allowed me to create bit-mapped images on an approximately 400 × 400 array. The square array is a flexible format for graphs; printouts on my Silentype fit nicely on an 8.5 by 11-inch page, and the image need not be printed sideways to have decent-sized margins.

These and other considerations resulted in the creation of an assembly-language program consisting of routines to be called from Applesoft Basic. These routines let me clear the graphics storage area, draw lines, plot points, and finally to print the results on my Silentype Printer. The number of pixels along the X axis is 400 (0 to 399) and 399 (0 to 398) along the Y axis. The graphics memory area begins at the start of Apple's high resolution page two (address 16384) and extends through address 36333. This is 2067 bytes short of the start of the disk operating system, and leaves ample room for the graphics routines which start at 36334 (8DEE hexadecimal).

First, let me give some examples that show how the program is used in conjunction with Applesoft Basic. This is followed by a description of the various routines in the assembly-language listing. Finally, suggestions for further work are presented.

Scribbling

First we'll consider a simple program which draws connected line segments with random start and end points. It's assumed that the assembly-language routines have been BLoaded into memory, and that the printer has been initialized and set for the desired density. Usually maximum density gives the best results. Listing 1 shows the Basic routine Scribble. The first variables defined in the program are the integer values for the start-of-line coordinates X0%,Y0% and the end-of-line coordinates X1%,Y1%. These variables must always be defined in the order shown and before any others, since the line and point drawing routines look at the first four numbers in the Basic program's list of variables. Therefore, when using these routines, it's a good idea to define X0%, Y0%, X1%, and Y1% right at the outset, as in line 10.

In line 20, the clear memory routine is called at address 37138. This sets each bit in the graphics storage area to zero. Line 30 sets up the coordinates for the first line to be drawn. The random-number function yields numbers between 0 and 1. These are scaled to give X coordinates between 0 and 399 and Y coordinates between 0 and 398, which is done to keep the line segments entirely inside the picture area. However, I should point out that there is no danger of writing outside of the graphics storage area and possibly damaging another program. The line and point plotting routines check, on a point-by-point basis, to make certain that no point is "plotted" if X or Y is out of bounds. Line 40 calls the line-drawing routine.

Lines 50 through 65 draw in 199

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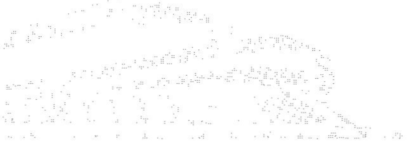

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Program listing 1.
Program to generate a pattern of connected line segments with random coordinates for vertices.

```
5  REM *********SCRIBBLE*********
10 X0% = 0:Y0% = 0:X1% = 0:Y1% = 0: REM   INITIALIZE PLOTTING
     VARIABLES.
15  REM   FIRST, CALL THE GRAPHICS MEMORY CLEAR ROUTINE FOR A CLEAN
     SLATE.
20  CALL 37138
25  REM   NEXT, SET THE COORDINATES FOR THE FIRST LINE.
30 X0% = 399 *  RND (1):Y0% = 398 *  RND (1):X1% = 399 *  RND (1):Y1
     % = 398 *  RND (1)
35  REM   NOW, DRAW THE FIRST LINE. X0% AND Y0% ARE SET EQUAL TO X1%
     AND Y1% AT THE END OF THE OPERATION.
40  CALL 36392
45  REM  FINALLY, DRAW 199 MORE LINES CONNECTED WITH THE FIRST.
50  FOR I = 1 TO 199
55 X1% = 399 *  RND (1):Y1% = 398 *  RND (1): REM  NOTE THAT WE NEED
     ONLY CHANGE X1% AND Y1% TO DRAW CONTINUED LINE SEGMENTS.
60  CALL 36392: REM   CALL LINE DRAW ROUTINE.
65  NEXT I
70  CALL 37196: REM   PRINT OUT THE IMAGE ON THE SILENTYPE.
75  END
```

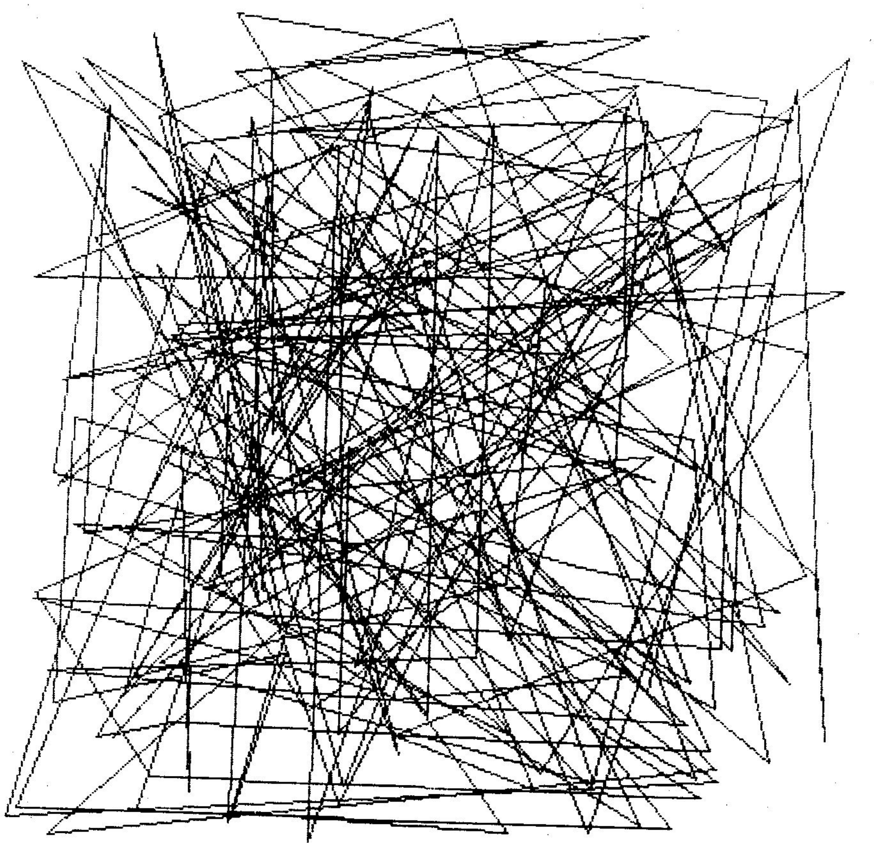

Figure 1. Image generated using the Scribble program of Listing 1 in conjunction with the graphics routines of Listing 3.

more line segments. Each successive one starts at its predecessor's end point. It's important to realize that when the line-drawing subroutine has completed a line, the starting-point variables X0% and Y0% have been set equal to the end-point variables X1% and Y1%. This makes drawing connected line segments simply a matter of successive changes in the end-point coordinates X1% and Y1% between calls to the line drawing routine.

Line 70 calls the Silentype graphics printout routine at address 37196. A sample run of Scribble is shown in Figure 1.

Drawing

Figure 2 shows a drawing of a sphere made by plotting the planar projections of various rotational positions of a couple of circles in three dimensions. The quality of the result, while not in the same league as that which could be had with a pen plotter, is nevertheless pleasing. The Basic program that generated this sphere is quite straightforward and I chose not to include it here.

Plotting

Listing 2 is a simple program that plots the functions of two variables in the form of a perspective drawing. The function of interest is specified as a subroutine starting at line 10. In the present example, I have chosen to plot

$$Z = \sin(X - 2\pi)\sin(Y - 2\pi) + 1$$

The program proper begins at line 100 with the usual variable definitions to be passed to the assembly-language plot routines. This is followed by the clear screen command in line 110. Next, line 120 dimensions two arrays which are used to store maximum and minimum function values for use in the hidden-line routine which starts at line 200. After defining some constants in lines 130 and 135, the program prompts the user to specify the maximum values to be used by the independent variables X and Y, and the dependent variable Z. The minimum values for each of these variables is assumed to be 0. In the present example, XMAX and YMAX are set equal to 2π, and ZMAX is set equal to 2.

Lines 200 through 360 comprise a rudimentary hidden-line plot routine in which the line-draw routine is called at line 330. Figure 2 shows the finished result printed on the Silentype. A second example of this type of plot is shown in Figure 3. The function used was of the general form

$$Z = ((\sin X)/X)^2((\sin Y)/Y)^2$$

which yields Z values proportional to the far-field intensity pattern of light diffracted from a square aperture.

Graphics Routines Overview

The assembler listing for the routines used in the examples is shown in Listing 3. There are basically five parts to the program. First, several parameters are defined in lines 170–840. These include indices for variables and constants (to be described shortly), the constants themselves, various addresses, and an eight-byte table used for setting individual bits in a selected byte.

Next comes the line-drawing routine, a 6502 version of an algorithm written in Basic by Mike Higgins

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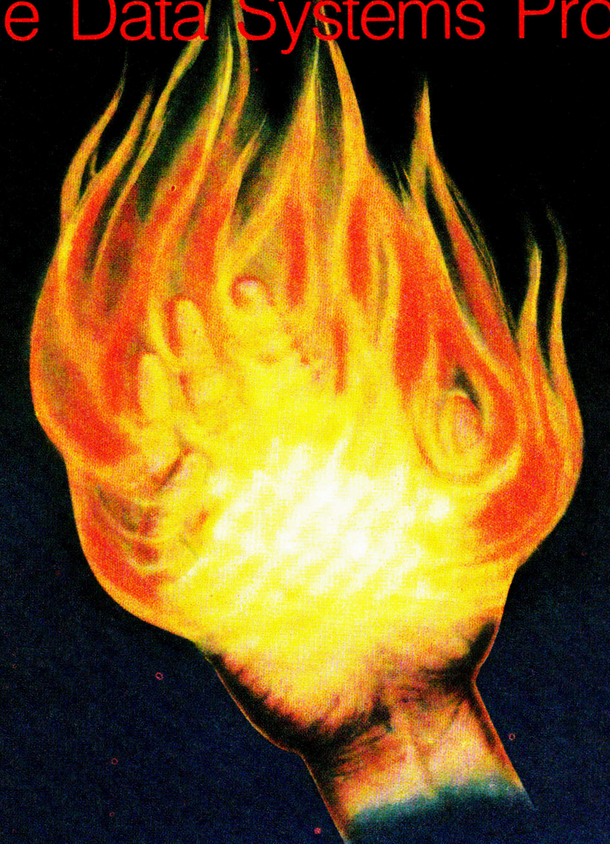

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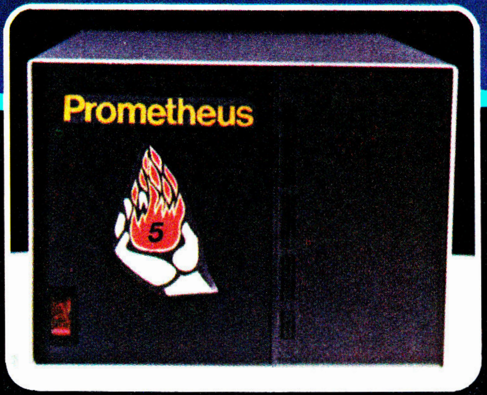

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Program listing 2.
Program to draw perspective plots of functions of two variables.

```
1   REM  *********CONTOUR PLOT*********
5   GOTO 100
10 Z =  SIN (X - A) *  SIN (Y - A) + 1
20  RETURN
100 X0% = 0:Y0% = 0:X1% = 0:Y1% = 0
110  CALL 37138: REM  CLEAR SCREEN
120  DIM MA%(400),MI%(400)
130 PX = 250:PY = 150:PZ = 245:P5 = .5
135 PI = 3.14159:A = 2 * PI: REM  DEFINE CONSTANTS FOR FUNCTION.
140  HOME : INPUT "XMAX= ";XF
145  INPUT "YMAX= ";YF
150  INPUT "ZMAX= ";ZF
200  REM  HIDDEN-LINE PLOT ROUTINE.
210  FOR J = 0 TO 400:MA%(J) = 0:MI%(J) = 398: NEXT
220  FOR J = 0 TO 150 STEP 2
221 X = 0:Y = J * YF / PY: GOSUB 10
222 Z = Z * PZ / ZF:Y0% = J +  INT (Z + P5):X0% = J
230  FOR I = 0 TO 250
240 Q = I + J
250 X = I * XF / PX
260 X1% = Q
270  GOSUB 10
280 Z = Z * PZ / ZF
290 Y1% =  INT (J + Z + P5)
300  IF Y1% < MA%(Q) AND Y1% > MI%(Q) THEN X0% = X1%:Y0% = Y1%: GOTO 350
310  IF Y1% > MA%(Q) THEN MA%(Q) = Y1%
320  IF Y1% < MI%(Q) THEN MI%(Q) = Y1%
330  CALL 36392: REM  PLOT X0%,Y0% TO X1%,Y1%
350  NEXT I
360  NEXT J
370  CALL 37196: REM  CALL THE SILENTYPE GRAPHICS PRINT ROUTINE
380  END
```

(*Byte*, August 1981, p. 414). This occupies lines 940–2760. I refer the reader to the article by Higgins for details on this line-drawing technique. The variable names used here are the same ones that Higgins used.

The third major section (lines 2780–3780) of the program is a collection of 16-bit routines that are used extensively by the previous section. Because you're dealing with coordinates spanning values greater than 255, you must use a two-byte representation for the numbers in the program. A description of these routines is given later.

Lines 4220–5260 contain the fourth section of the program. Here the coordinates generated by the line-drawing routine are taken and the appropriate bit in the graphics storage area is set according to the bit-mapping scheme to be described below.

After a short section of code to clear the graphics storage area (lines 5280–5550) comes the final section of the program: the Silentype graphics dump routine. Let's examine some parts of this program in more detail.

Sixteen-Bit Calculations

As noted above, the line-drawing routine uses 16-bit numbers in its coordinate calculations. One approach to deal with frequently needed 16-bit calculations on an 8-bit machine is to implement an interpreter. To avoid the interpretation time, I wrote a collection of subroutines which operate on the variables specified by the contents of the two 6502 index registers at the time of the subroutine call.

For instance, the indices for the variables N1 and D1 are specified in lines 260 and 270 of Listing 3. To add these two variables, I would load the processor's X and Y index registers with the indices for N1 and D1 and call the subroutine XPLUSY (line 2880). This subroutine accesses and adds the two variables of interest by using the absolute indexed address mode with base address VARSTO. The 16-bit result is stored in a couple of bytes set aside as a sort of double-precision accumulator (DPACC).

The sign and zero bits in the 6502 status register are set according to the 16-bit result. That is, a negative 16-bit sum would yield a 1 for the sign bit, and a 16-bit sum of zero would cause

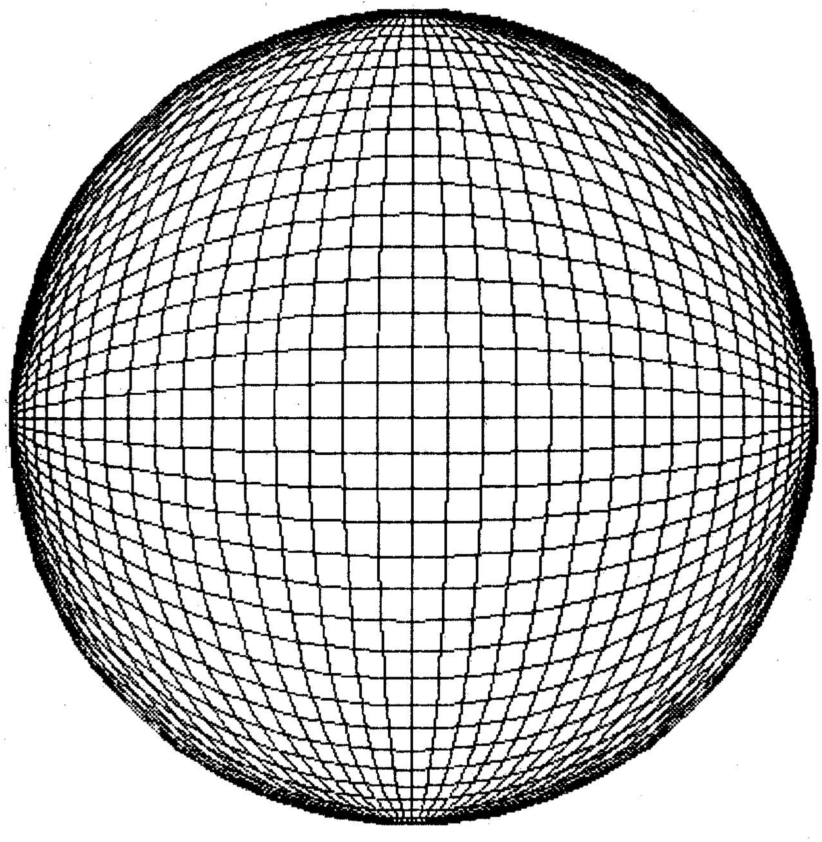


Figure 2. Drawing of a sphere made by two-dimensional projections of circles in three dimensions.

Program listing 3. Assembly listing of graphics routines described in the text.

```
0010 ; LINE AND POINT PLOTTING AND SILENTYPE
0020 ; GRAPHICS DUMP FOR A 400X399-PIXEL ARRAY.
0030 ;
0040 ;         BY PAUL SCHUBERT
0050 ;              1982
0060 ;
0070 ;*****************************************
0080 ;
0090 ; DEFINE INDICES AND SET ASIDE STORAGE
0100 ; SPACE FOR VARIABLES AND CONSTANTS.
```

Listing 3 continued.

the zero bit to be set. If I wished to store N1 + D1 at the memory position reserved for yet a third variable, I would invoke the subroutine ACCTOX, which replaces the variable indexed in the X register with the current value in DPACC.

In addition to these two subroutines, others use the same indexing scheme for accessing variables and constants. These include: XMINUY, which places the difference of the two indexed quantities in DPACC; SIGNX, which sets the sign and zero bits in the processor status register appropriate for the 16-bit quantity indexed by the X register; and INCREX and DECREX, which increment and decrement the indexed quantity and set the sign and zero bits after the operation.

In addition to ACCTOX described above, there are two further move routines, XTOY and XTOPTR. The former is self-explanatory and the latter is useful for transferring indexed variables to zero-page addresses 6 and 7 (MAPPTR) for use in indirect addressing. This brief set of routines served my needs nicely for the software described here. Clearly, the set can easily be extended for other purposes.

Two features of this indexing approach make it useful for translating simple Basic programs into assembly language. First, the indexing itself allows the user to deal with named variables in a simple way. Second, because many of the routines return the zero and sign bits in the status register according to the 16-bit result, it's fairly simple to implement For...Next loops. This latter capability was handy for the Silentype printer driver described below.

Point-Plotting Routine

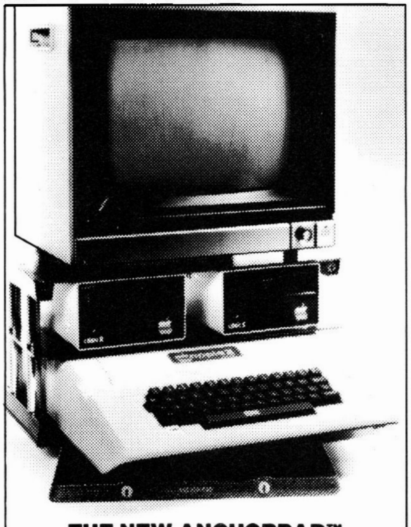
The heart of this graphics package is the subroutine that takes the coordinates generated by the line-drawing routine and sets the appropriate bit in the graphics storage area. Lines 4240–5260 in Listing 3 show this code titled DPlot. Each time a new pixel is added to a line being drawn, the coordinates of that pixel are used by DPlot to plot the proper bit.

First, in lines 4240–4410, the coordinates, stored in the indexed variables X0 and Y0, are checked to see if they fall within 0–399 for X0 and 0–398 for

Listing continued.

```
                    0110 ; ALSO, ASSIGN ADDRESSES FOR APPLESOFT
                    0120 ; START-OF-VARIABLES POINTER, A ZERO-
                    0130 ; PAGE IMAGE ADDRESS POINTER (MAPPTR),
                    0140 ; A 16-BIT ACCUMULATOR (DPACC), AND A
                    0150 ; MASK TABLE (BITMAP).
                    0160 ;
                    0170 NUMVAR .DE 12
                    0180 ;
                    0190           .BA 36334
                    0200 ; STORAGE SPACE FOR VARIABLES.
                    0210 ;
8DEE-               0220 VARSTO .DS NUMVAR+NUMVAR
                    0230 ;
                    0240 ; INDICES FOR VARIABLES.
                    0250 ;
                    0260 N1     .DE 0
                    0270 D1     .DE 2
                    0280 D2     .DE 4
                    0290 D3     .DE 6
                    0300 S1     .DE 8
                    0310 S2     .DE 10
                    0320 A1     .DE 12
                    0330 A2     .DE 14
                    0340 X0     .DE 16
                    0350 Y0     .DE 18
                    0360 X1     .DE 20
                    0370 Y1     .DE 22
                    0380 ;
                    0390 ; STORED CONSTANTS.
                    0400 ;
8E06- 00 00         0410        .BY 0 0
8E08- 00 01         0420        .BY 0 1
8E0A- FF FF         0430        .BY $FF $FF
8E0C- 01 8E         0440        .BY $01 $8E
8E0E- 01 8F         0450        .BY $01 $8F
8E10- 40 00         0460        .BY $40 $00
8E12- 8D ED         0470        .BY $8D $ED
8E14- 00 07         0480        .BY 00 07
8E16- 8D EE         0490        .BY $8D $EE
8E18- 41 5E         0500        .BY $41 $5E
8E1A- 01 5E         0510        .BY $01 $5E
8E1C- 00 31         0520        .BY $00 $31
                    0530 ;
                    0540 ; INDICES FOR CONSTANTS.
                    0550 ;
                    0560 C0     .DE NUMVAR+NUMVAR
                    0570 C1     .DE C0+2
                    0580 CM1    .DE C1+2
                    0590 C398   .DE CM1+2
```

Listing 3 continued.



Listing continued.

```
                 0600 C399   .DE C398+2
                 0610 C16384 .DE C399+2       ;START ADDR OF IMAGE MEMORY.
                 0620 C36333 .DE C16384+2     ;END ADDR OF BIT-MAPPED MEMORY.
                 0630 C7     .DE C36333+2
                 0640 C36334 .DE C7+2
                 0650 C16734 .DE C36334+2
                 0660 C350   .DE C16734+2
                 0670 C49    .DE C350+2
                 0680        ;
                 0690 VARPTR .DE $69  ;BASIC START OF VARIABLES PTR.
                 0700 ;
                 0710 MAPPTR .DE 6    ;POINTER TO START OF IMAGE MEMORY.
                 0720 ;
8E1E- 00 00      0730 DPACC  .BY 0 0 ;16-BIT ACCUMULATOR.
                 0740 ;
                 0750 ;BIT MAP TABLE.
                 0760 ;
8E20- 01         0770 BITMAP .BY 1
8E21- 02         0780        .BY 2
8E22- 04         0790        .BY 4
8E23- 08         0800        .BY 8
8E24- 10         0810        .BY 16
8E25- 20         0820        .BY 32
8E26- 40         0830        .BY 64
8E27- 80         0840        .BY 128
                 0850 ;
                 0860 ; 6502 ASSEMBLY-LANGUAGE VERSION OF LINE-
                 0870 ; DRAWING ROUTINE BY MIKE HIGGINS, BYTE,
                 0880 ; AUGUST 1981, PAGE 414.  BEGIN BY RE-
                 0890 ; TRIEVING THE BASIC VARIABLES X0,Y0,X1,
                 0900 ; AND Y1.
                 0910 ;
8E28- 20 00 90   0920 LIDRAW JSR GETBAS
                 0930 ;
                 0940 ; D1=X1-X0
                 0950 ;
8E2B- A2 14      0960        LDX #X1
8E2D- A0 10      0970        LDY #X0
8E2F- 20 81 8F   0980        JSR XMINUY
8E32- A2 02      0990        LDX #D1
8E34- 20 B0 8F   1000        JSR ACCTOX
                 1010 ;
                 1020 ; D2=Y1-Y0
                 1030 ;
8E37- A2 16      1040        LDX #Y1
8E39- A0 12      1050        LDY #Y0
8E3B- 20 81 8F   1060        JSR XMINUY
8E3E- A2 04      1070        LDX #D2
8E40- 20 B0 8F   1080        JSR ACCTOX
                 1090 ;
                 1100 ; S1=0,S2=1,A1=1,A2=0
                 1110 ;
8E43- A2 18      1120        LDX #C0
8E45- A0 08      1130        LDY #S1
8E47- 20 E3 8F   1140        JSR XTOY
8E4A- A2 1A      1150        LDX #C1
8E4C- A0 0A      1160        LDY #S2
8E4E- 20 E3 8F   1170        JSR XTOY
8E51- A2 1A      1180        LDX #C1
8E53- A0 0C      1190        LDY #A1
8E55- 20 E3 8F   1200        JSR XTOY
8E58- A2 18      1210        LDX #C0
8E5A- A0 0E      1220        LDY #A2
8E5C- 20 E3 8F   1230        JSR XTOY
                 1240 ;
                 1250 ; IF D1 >=0 GOTO LABEL1
                 1260 ;
8E5F- A2 02      1270        LDX #D1
8E61- 20 A2 8F   1280        JSR SIGNX
8E64- 10 13      1290        BPL LABEL1
                 1300 ;
                 1310 ; A1=-1, D1=-D1
                 1320 ;
8E66- A2 1C      1330        LDX #CM1
8E68- A0 0C      1340        LDY #A1
8E6A- 20 E3 8F   1350        JSR XTOY
8E6D- A2 18      1360        LDX #C0
8E6F- A0 02      1370        LDY #D1
8E71- 20 81 8F   1380        JSR XMINUY
8E74- A2 02      1390        LDX #D1
8E76- 20 B0 8F   1400        JSR ACCTOX
                 1410 ;
                 1420 ; IF D2>=0 GOTO LABEL2
                 1430 ;
8E79- A2 04      1440 LABEL1 LDX #D2
8E7B- 20 A2 8F   1450        JSR SIGNX
8E7E- 10 13      1460        BPL LABEL2
                 1470 ;
                 1480 ; D2=-D2, S2=-1
                 1490 ;
8E80- A2 18      1500        LDX #C0
8E82- A0 04      1510        LDY #D2
8E84- 20 81 8F   1520        JSR XMINUY
8E87- A2 04      1530        LDX #D2
8E89- 20 B0 8F   1540        JSR ACCTOX
8E8C- A2 1C      1550        LDX #CM1
8E8E- A0 0A      1560        LDY #S2
8E90- 20 E3 8F   1570        JSR XTOY
                 1580 ;
                 1590 ; IF D1>=D2 GOTO LABEL3
```

Listing 3 continued.

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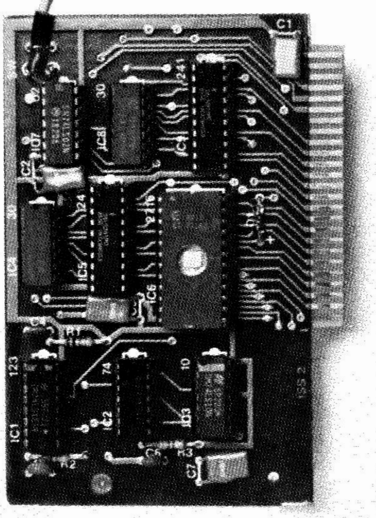

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Listing continued.

```
                   1600 ;
8E93- A2 02        1610 LABEL2 LDX #D1
8E95- A0 04        1620        LDY #D2
8E97- 20 81 8F     1630        JSR XMINUY
8E9A- 10 31        1640        BPL LABEL3
                   1650 ;
                   1660 ; N1=D1, D1=D2, D2=N1, S1=A1, A1=0
                   1670 ;
8E9C- A2 02        1680        LDX #D1
8E9E- A0 00        1690        LDY #N1
8EA0- 20 E3 8F     1700        JSR XTOY
8EA3- A2 04        1710        LDX #D2
8EA5- A0 02        1720        LDY #D1
8EA7- 20 E3 8F     1730        JSR XTOY
8EAA- A2 00        1740        LDX #N1
8EAC- A0 04        1750        LDY #D2
8EAE- 20 E3 8F     1760        JSR XTOY
8EB1- A2 0C        1770        LDX #A1
8EB3- A0 08        1780        LDY #S1
8EB5- 20 E3 8F     1790        JSR XTOY
8EB8- A2 18        1800        LDX #C0
8EBA- A0 0C        1810        LDY #A1
8EBC- 20 E3 8F     1820        JSR XTOY
                   1830 ;
                   1840 ; A2=S2, S2=0
                   1850 ;
8EBF- A2 0A        1860        LDX #S2
8EC1- A0 0E        1870        LDY #A2
8EC3- 20 E3 8F     1880        JSR XTOY
8EC6- A2 18        1890        LDX #C0
8EC8- A0 0A        1900        LDY #S2
8ECA- 20 E3 8F     1910        JSR XTOY
                   1920 ;
                   1930 ; D3=D1/2, N1=1
                   1940 ;
8ECD- A2 02        1950 LABEL3 LDX #D1
8ECF- A0 06        1960        LDY #D3
8ED1- 20 E3 8F     1970        JSR XTOY
8ED4- A2 06        1980        LDX #D3
8ED6- 5E EE 8D     1990        LSR UARSTO,X
8ED9- E8           2000        INX
8EDA- 7E EE 8D     2010        ROR UARSTO,X
8EDD- A2 1A        2020        LDX #C1
8EDF- A0 00        2030        LDY #N1
8EE1- 20 E3 8F     2040        JSR XTOY
                   2050 ;
                   2060 ; CALL THE PLOT ROUTINE.
                   2070 ;
8EE4- 20 37 90     2080 LABEL4 JSR DPLOT
                   2090 ;
                   2100 ; IF D1-N1<0 THEN RETURN.
                   2110 ;
8EE7- A2 02        2120        LDX #D1
8EE9- A0 00        2130        LDY #N1
8EEB- 20 81 8F     2140        JSR XMINUY
8EEE- 10 0F        2150        BPL CONT
8EF0- A0 02        2160        LDY #2
8EF2- A2 10        2170        LDX #X0
8EF4- 20 2A 90     2180        JSR PUTBAK
8EF7- A0 09        2190        LDY #9
8EF9- A2 12        2200        LDX #Y0
8EFB- 20 2A 90     2210        JSR PUTBAK
8EFE- 60           2220        RTS
                   2230 ;
                   2240 ; X0=X0+A1, Y0=Y0+A2
                   2250 ;
8EFF- A2 10        2260 CONT   LDX #X0
8F01- A0 0C        2270        LDY #A1
8F03- 20 60 8F     2280        JSR XPLUSY
8F06- A2 10        2290        LDX #X0
8F08- 20 B0 8F     2300        JSR ACCTOX
8F0B- A2 12        2310        LDX #Y0
8F0D- A0 0E        2320        LDY #A2
8F0F- 20 60 8F     2330        JSR XPLUSY
8F12- A2 12        2340        LDX #Y0
8F14- 20 B0 8F     2350        JSR ACCTOX
                   2360 ;
                   2370 ; D3=D3+D2, N1=N1+1
                   2380 ;
8F17- A2 06        2390        LDX #D3
8F19- A0 04        2400        LDY #D2
8F1B- 20 60 8F     2410        JSR XPLUSY
8F1E- A2 06        2420        LDX #D3
8F20- 20 B0 8F     2430        JSR ACCTOX
8F23- A2 00        2440        LDX #N1
8F25- 20 BE 8F     2450        JSR INCREX
                   2460 ;
                   2470 ; IF D1-D3 > 0 GOTO LABEL4.
                   2480 ;
8F28- A2 06        2490        LDX #D3
8F2A- A0 02        2500        LDY #D1
8F2C- 20 81 8F     2510        JSR XMINUY
8F2F- 30 B3        2520        BMI LABEL4
                   2530 ;
                   2540 ; D3=D3-D1,X0=X0+S1,Y0=Y0+S2, GOTO LABEL4
                   2550 ;
8F31- A2 06        2560        LDX #D3
8F33- A0 02        2570        LDY #D1
8F35- 20 81 8F     2580        JSR XMINUY
8F38- A2 06        2590        LDX #D3
8F3A- 20 B0 8F     2600        JSR ACCTOX
8F3D- A2 10        2610        LDX #X0
```

Listing 3 continued.

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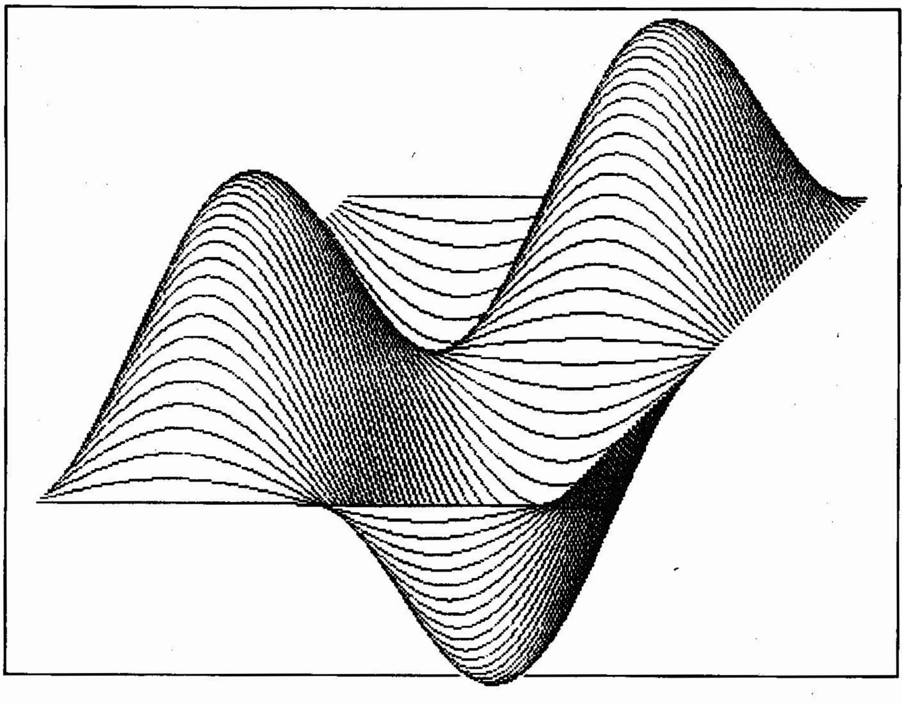

Figure 3. Example of a perspective plot of a function of two variables made using the Contour Plot program of Listing 2 along with graphics routines of Listing 3.

Y0. If they don't, the point is not plotted and control is passed back to the line-drawing routine, which then generates a new pixel if it has not completed the line. If the coordinates are within range, control is passed to PlotPT at line 4450. This calculates the address and bit position in the graphics storage area that corresponds to the pixel coordinates.

The graphics storage area, extending from address 16384 through address 36333, is arranged as 399 rows of 50 bytes each. The least-significant bit in the first byte of this block of memory stores the pixel value for coordinates 0,0. The next 49 bytes hold pixel values for coordinates 7,0 through 399,0 (the X axis). The following 50 bytes contain the row of coordinates 0,1 through 399,1 and so forth.

PlotPT uses two page-zero addresses that form a 16-bit pointer called MAPPTR. First, the starting address 16384 of the graphics storage area is loaded into this pointer. Then, to get to the appropriate row in the array, the Y coordinate multiplied by 50 is added to the starting address in MAPPTR. Next, the byte in this row which contains the pixel value of interest is addressed by adding X0/8 to the contents of MAPPTR. In the process of dividing by 8, the remainder is kept track of for use in selecting the particular bit corresponding to the current pixel. For instance, a remainder of 3 would set bit position 3 (corresponding to the number 8); a remainder of 7 would set bit position 7 (corresponding to the number 128). Bits are set with the ORA instruction in an indirect indexed address mode in lines 5240 and 5250.

You could speed up this point-plotting scheme in several ways. First, you could eliminate the range-checking code in lines 4240–4410. However, the freedom from worrying about out-of-range coordinates is a valuable feature. Another time-consuming bit of code is that which multiplies the Y coordinate by 50 (lines 4510–4920). Clearly, using 64 rows instead of 50 would make this multiplication much easier. But the shape of the display would then have to be an ill proportioned rectangle to fit in 20,000 bytes of memory. In any case, the routine as

Listing continued.

```
8F3F- A0 08     2620        LDY #S1
8F41- 20 60 8F  2630        JSR XPLUSY
8F44- A2 10     2640        LDX #X0
8F46- 20 B0 8F  2650        JSR ACCTOX
8F49- A2 12     2660        LDX #Y0
8F4B- A0 0A     2670        LDY #S2
8F4D- 20 60 8F  2680        JSR XPLUSY
8F50- A2 12     2690        LDX #Y0
8F52- 20 B0 8F  2700        JSR ACCTOX
8F55- D0 8D     2710        BNE LABEL4
8F57- F0 8B     2720        BEQ LABEL4
                2730 ;
8F59- 20 00 90  2740 PTDRAW JSR GETBAS
8F5C- 20 37 90  2750        JSR DPLOT
8F5F- 60        2760        RTS
                2770 ;
                2780 ; COLLECTION OF SUBROUTINES TO HANDLE
                2790 ; 16-BIT ADDITIONS, SUBTRACTIONS, INCREMENTS,
                2800 ; DECREMENTS, SIGN TESTING, AND VARIABLE SWAPPING.
                2810 ; THESE ROUTINES ARE USED IN CONJUNCTION
                2820 ; WITH THE PROCESSOR X AND Y INDEX REGISTERS
                2830 ; WHICH ARE LOADED WITH THE VARIABLE OR
                2840 ; CONSTANT INDICES BEFORE CALLING THE SUBROUTINE.
                2850 ;
                2860 ; ADD TWO NUMBERS INDEXED BY X AND Y. STORE IN DPACC.
                2870 ;
8F60- E8        2880 XPLUSY INX
8F61- C8        2890        INY
8F62- 18        2900        CLC
8F63- BD EE 8D  2910        LDA VARSTO,X
8F66- 79 EE 8D  2920        ADC VARSTO,Y
8F69- 8D 1F 8E  2930        STA DPACC+$1
8F6C- CA        2940        DEX
8F6D- 88        2950        DEY
8F6E- BD EE 8D  2960        LDA VARSTO,X
8F71- 79 EE 8D  2970        ADC VARSTO,Y
8F74- 8D 1E 8E  2980        STA DPACC
8F77- D0 07     2990        BNE RTN1
8F79- AD 1F 8E  3000        LDA DPACC+1
8F7C- F0 02     3010        BEQ RTN1
8F7E- A9 01     3020        LDA #1
8F80- 60        3030 RTN1   RTS
                3040 ;
                3050 ; SUBTRACT (X)-(Y). STORE IN DPACC.
                3060 ;
8F81- E8        3070 XMINUY INX
8F82- C8        3080        INY
8F83- 38        3090        SEC
8F84- BD EE 8D  3100        LDA VARSTO,X
8F87- F9 EE 8D  3110        SBC VARSTO,Y
8F8A- 8D 1F 8E  3120        STA DPACC+1
8F8D- CA        3130        DEX
8F8E- 88        3140        DEY
8F8F- BD EE 8D  3150        LDA VARSTO,X
8F92- F9 EE 8D  3160        SBC VARSTO,Y
8F95- 8D 1E 8E  3170        STA DPACC
8F98- D0 07     3180        BNE RTN2
8F9A- AD 1F 8E  3190        LDA DPACC+1
8F9D- F0 02     3200        BEQ RTN2
8F9F- A9 01     3210        LDA #1
8FA1- 60        3220 RTN2   RTS
                3230 ;
                3240 ; SET N AND Z BITS ACCORDING TO 16-BIT NUMBER INDEXED BY X.
                3250 ;
```

Listing 3 continued.

Listing continued.

```
8FA2- BD EE 8D  3260 SIGNX  LDA VARSTO,X
8FA5- D0 08     3270        BNE RTN3
8FA7- E8        3280        INX
8FA8- BD EE 8D  3290        LDA VARSTO,X
8FAB- F0 02     3300        BEQ RTN3
8FAD- A9 01     3310        LDA #1
8FAF- 60        3320 RTN3   RTS
                3330 ;
                3340 ; TRANSFER DPACC TO VARIABLE INDEXED BY X.
                3350 ;
8FB0- AD 1E 8E  3360 ACCTOX LDA DPACC
8FB3- 9D EE 8D  3370        STA VARSTO,X
8FB6- E8        3380        INX
8FB7- AD 1F 8E  3390        LDA DPACC+1
8FBA- 9D EE 8D  3400        STA VARSTO,X
8FBD- 60        3410        RTS
                3420 ;
                3430 ; INCREMENT VARIABLE INDEXED BY X
                3440 ;
8FBE- E8        3450 INCREX INX
8FBF- FE EE 8D  3460        INC VARSTO,X
8FC2- D0 05     3470        BNE SIGNFL
8FC4- CA        3480        DEX
8FC5- FE EE 8D  3490        INC VARSTO,X
8FC8- E8        3500        INX
8FC9- CA        3510 SIGNFL DEX
8FCA- 20 A2 8F  3520        JSR SIGNX
8FCD- 60        3530        RTS
                3540 ;
                3550 ; DECREMENT VARIABLE INDEXED BY X.
                3560 ;
8FCE- E8        3570 DECREX INX
8FCF- DE EE 8D  3580        DEC VARSTO,X
8FD2- A9 FF     3590        LDA #$FF
8FD4- DD EE 8D  3600        CMP VARSTO,X
8FD7- D0 05     3610        BNE SIGNF1
8FD9- CA        3620        DEX
8FDA- DE EE 8D  3630        DEC VARSTO,X
8FDD- E8        3640        INX
8FDE- CA        3650 SIGNF1 DEX
8FDF- 20 A2 8F  3660        JSR SIGNX
8FE2- 60        3670        RTS
                3680 ;
                3690 ; (X) --> (Y)
                3700 ;
8FE3- BD EE 8D  3710 XTOY   LDA VARSTO,X
8FE6- 99 EE 8D  3720        STA VARSTO,Y
8FE9- E8        3730        INX
8FEA- C8        3740        INY
8FEB- BD EE 8D  3750        LDA VARSTO,X
8FEE- 99 EE 8D  3760        STA VARSTO,Y
8FF1- 60        3770        RTS
                3780        ;
                3790        ;(X) --> MAPPTR (LO,HI ORDER)
                3800        ;
8FF2- BD EE 8D  3810 XTOPTR LDA VARSTO,X
8FF5- 85 07     3820        STA *MAPPTR+1
8FF7- E8        3830        INX
8FF8- BD EE 8D  3840        LDA VARSTO,X
8FFB- 85 06     3850        STA *MAPPTR
8FFD- A0 00     3860        LDY #0
8FFF- 60        3870        RTS
                3880        ;
                3890 ; STORE THE BASIC VARIABLES X0,Y0,X1, AND Y1.
                3900 ;
9000- A0 02     3910 GETBAS LDY #2
9002- A2 10     3920        LDX #X0
9004- 20 1D 90  3930        JSR STORPT
9007- A0 09     3940        LDY #9
9009- A2 12     3950        LDX #Y0
900B- 20 1D 90  3960        JSR STORPT
900E- A0 10     3970        LDY #16
9010- A2 14     3980        LDX #X1
9012- 20 1D 90  3990        JSR STORPT
9015- A0 17     4000        LDY #23
9017- A2 16     4010        LDX #Y1
9019- 20 1D 90  4020        JSR STORPT
901C- 60        4030        RTS
901D- B1 69     4040 STORPT LDA (VARPTR),Y
901F- 9D EE 8D  4050        STA VARSTO,X
9022- E8        4060        INX
9023- C8        4070        INY
9024- B1 69     4080        LDA (VARPTR),Y
9026- 9D EE 8D  4090        STA VARSTO,X
9029- 60        4100        RTS
                4110 ;
                4120 ; RESTORE X0 AND Y0 TO BASIC.
                4130 ;
902A- BD EE 8D  4140 PUTBAK LDA VARSTO,X
902D- 91 69     4150        STA (VARPTR),Y
902F- E8        4160        INX
9030- C8        4170        INY
9031- BD EE 8D  4180        LDA VARSTO,X
9034- 91 69     4190        STA (VARPTR),Y
9036- 60        4200        RTS
                4210 ;
                4220 ; POINT PLOT ROUTINE ON 400 X 399 PIXEL DISPLAY.
                4230 ;
9037- A2 20     4240 DPLOT  LDX #C399        ;CHECK TO SEE X0 AND Y0 IN BOUNDS.
9039- A0 10     4250        LDY #X0
903B- 20 81 8F  4260        JSR XMINUY
```

Listing 3 continued.

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Listing continued.

```
903E- 10 01      4270        BPL NEXT0
9040- 60         4280        RTS
9041- A2 10      4290 NEXT0  LDX #X0
9043- 20 A2 8F   4300        JSR SIGNX
9046- 10 01      4310        BPL NEXT1
9048- 60         4320        RTS
9049- A2 1E      4330 NEXT1  LDX #C398
904B- A0 12      4340        LDY #Y0
904D- 20 81 8F   4350        JSR XMINUY
9050- 10 01      4360        BPL NEXT2
9052- 60         4370        RTS
9053- A2 12      4380 NEXT2  LDX #Y0
9055- 20 A2 8F   4390        JSR SIGNX
9058- 10 01      4400        BPL PLOTPT
905A- 60         4410        RTS
                 4420 ;
                 4430 ; CONVERT X0 AND Y0 TO APPROPRIATE BIT AND SET THE BIT.
                 4440 ;
905B- A2 22      4450 PLOTPT LDX #C16384       ;PUT START ADDR OF IMAGE MEMORY INT
O MAPPTR.
905D- BD EE 8D   4460        LDA VARSTO,X
9060- 85 07      4470        STA *MAPPTR+1
9062- E8         4480        INX
9063- BD EE 8D   4490        LDA VARSTO,X
9066- 85 06      4500        STA *MAPPTR
9068- A2 12      4510        LDX #Y0  ;ADD 50*Y0 TO ADDR IN MAPPTR.
906A- BD EE 8D   4520        LDA VARSTO,X
906D- 8D 1E 8E   4530        STA DPACC
9070- E8         4540        INX
9071- BD EE 8D   4550        LDA VARSTO,X
9074- 8D 1F 8E   4560        STA DPACC+1
9077- 18         4570        CLC       ;TAKE 2*(DPACC)
9078- 2E 1F 8E   4580        ROL DPACC+1
907B- 2E 1E 8E   4590        ROL DPACC
907E- AD 1F 8E   4600        LDA DPACC+1
9081- 18         4610        CLC
9082- 65 06      4620        ADC *MAPPTR
9084- 85 06      4630        STA *MAPPTR
9086- AD 1E 8E   4640        LDA DPACC
9089- 65 07      4650        ADC *MAPPTR+1
908B- 85 07      4660        STA *MAPPTR+1
908D- 18         4670        CLC       ;GET 16*Y0 USING FURTHER LEFT SHIFTS.
908E- 2E 1F 8E   4680        ROL DPACC+1
9091- 2E 1E 8E   4690        ROL DPACC
9094- 18         4700        CLC
9095- 2E 1F 8E   4710        ROL DPACC+1
9098- 2E 1E 8E   4720        ROL DPACC
909B- 18         4730        CLC
909C- 2E 1F 8E   4740        ROL DPACC+1
909F- 2E 1E 8E   4750        ROL DPACC
90A2- AD 1F 8E   4760        LDA DPACC+1       ;ADD 16*Y TO ADDR IN MAPPTR.
90A5- 18         4770        CLC
90A6- 65 06      4780        ADC *MAPPTR
90A8- 85 06      4790        STA *MAPPTR
90AA- AD 1E 8E   4800        LDA DPACC
90AD- 65 07      4810        ADC *MAPPTR+1
90AF- 85 07      4820        STA *MAPPTR+1
90B1- 18         4830        CLC       ;GET 32*Y0 BY ONE LAST ROLL LEFT.
90B2- 2E 1F 8E   4840        ROL DPACC+1
90B5- 2E 1E 8E   4850        ROL DPACC
90B8- AD 1F 8E   4860        LDA DPACC+1       ;ADD 32*Y0 TO START ADDRESS.
90BB- 18         4870        CLC
90BC- 65 06      4880        ADC *MAPPTR
90BE- 85 06      4890        STA *MAPPTR
90C0- AD 1E 8E   4900        LDA DPACC
90C3- 65 07      4910        ADC *MAPPTR+1
90C5- 85 07      4920        STA *MAPPTR+1
90C7- A2 10      4930        LDX #X0  ;NOW ADD X0/8 TO MAPPTR AND KEEP TRACK OF R
EMAINDER.
90C9- BD EE 8D   4940        LDA VARSTO,X
90CC- 8D 1E 8E   4950        STA DPACC
90CF- E8         4960        INX
90D0- BD EE 8D   4970        LDA VARSTO,X
90D3- 8D 1F 8E   4980        STA DPACC+1
90D6- A9 00      4990        LDA #0
90D8- 4E 1E 8E   5000        LSR DPACC
90DB- 6E 1F 8E   5010        ROR DPACC+1
90DE- 90 02      5020        BCC NOBIT1
90E0- A9 01      5030        LDA #1
90E2- 4E 1E 8E   5040 NOBIT1 LSR DPACC
90E5- 6E 1F 8E   5050        ROR DPACC+1
90E8- 90 03      5060        BCC NOBIT2
90EA- 18         5070        CLC
90EB- 69 02      5080        ADC #2
90ED- 4E 1E 8E   5090 NOBIT2 LSR DPACC
90F0- 6E 1F 8E   5100        ROR DPACC+1
90F3- 90 03      5110        BCC NOBIT3
90F5- 18         5120        CLC
90F6- 69 04      5130        ADC #4
90F8- A8         5140 NOBIT3 TAY
90F9- AD 1F 8E   5150        LDA DPACC+1
90FC- 18         5160        CLC
90FD- 65 06      5170        ADC *MAPPTR
90FF- 85 06      5180        STA *MAPPTR
9101- AD 1E 8E   5190        LDA DPACC
9104- 65 07      5200        ADC *MAPPTR+1
9106- 85 07      5210        STA *MAPPTR+1
9108- B9 20 8E   5220        LDA BITMAP,Y
910B- A0 00      5230        LDY #0
910D- 11 06      5240        ORA (MAPPTR),Y
910F- 91 06      5250        STA (MAPPTR),Y
9111- 60         5260        RTS
                 5270 ;
```

Listing 3 continued.

it stands plots about 1000 points per second—adequate for most applications.

Silentype Printer Output

The last section in Listing 3 is the Silentype printer graphics dump routine, lines 5570–6540. The Silentype is controlled by ROM routines stored on the printer interface card. This makes it a simple matter to control the printer from an assembly-language program. For instance, to home the printer head to the left margin, simply issue a JSR SFTLFT, where SFTLFT is defined to be address $CD02 in line 5630.

Two other ROM subroutines used in this program are PRNT (address $CB0B) and FEED ($CCAB). The PRNT routine causes the thermal head to print a column of dots at its current position, and then advance one dot distance to the right. The contents of address DOTS ($CF2B) determines which of the seven thermal elements will actually be energized to form a black dot on the page. The least-significant bit controls the bottom dot, and so forth. The Feed routine simply shifts the page down vertically seven dot positions.

The exercise, then, is to keep feeding register DOTS with the appropriate bits while moving the head along and printing. The image is printed right side up on the page, and so the routine begins by accessing the seven bytes which hold the values for the block of 7 vertical by 8 horizontal pixels in the upper left corner of the image. These seven bytes are stored in a buffer starting at address PIXBYT (line 5670).

Then the least-significant bit in each of them is shifted into the appropriate position in DOTS, and PRNT is called. After seven more shifts into DOTS, the upper-leftmost block of 7 by 8 pixels has been printed and the printer is ready for the block immediately to the right. When the 50 blocks of 7 by 8 pixels comprising the top 7 rows of the image have been printed, the routine starts over at the left and begins work on the next seven rows of the image. This proceeds until all 57 groups of seven-image rows have been printed. Incidentally, I chose the number 399 (the total number of rows in the image) because it is evenly divisible by 7, the number of thermal elements in the printer head.

Listing continued.

```
                 5280 ; SCREEN CLEAR ROUTINE.
                 5290 ;
9112- A2 22      5300 CLSCRN LDX #C16384
9114- BD EE 8D   5310        LDA VARSTO,X
9117- 85 07      5320        STA *MAPPTR+1
9119- E8         5330        INX
911A- BD EE 8D   5340        LDA VARSTO,X
911D- 85 06      5350        STA *MAPPTR
911F- A2 25      5360        LDX #C36333+1
9121- BD EE 8D   5370        LDA VARSTO,X
9124- AA         5380        TAX       ;PUT LOW BYTE OF END ADDR IN X REG.
9125- A9 00      5390        LDA #0
9127- A8         5400        TAY
9128- 91 06      5410 LOOP8  STA (MAPPTR),Y
912A- E4 06      5420        CPX *MAPPTR
912C- F0 08      5430        BEQ CMPHI
912E- E6 06      5440 LOOP7  INC *MAPPTR
9130- D0 F6      5450        BNE LOOP8
9132- E6 07      5460        INC *MAPPTR+1
9134- D0 F2      5470        BNE LOOP8
9136- A0 24      5480 CMPHI  LDY #C36333
9138- B9 EE 8D   5490        LDA VARSTO,Y
913B- C5 07      5500        CMP *MAPPTR+1
913D- F0 05      5510        BEQ DONE7
913F- A9 00      5520        LDA #0
9141- A8         5530        TAY
9142- F0 EA      5540        BEQ LOOP7
9144- 60         5550 DONE7  RTS
                 5560        ;
                 5570 ; SILENTYPE PRINTER OUTPUT MODULE FOR 400X399 GRAPHICS.
                 5580 ;
                 5590 SLOT   .DE $C100
                 5600 LFMG   .DE $CF11
                 5610 DOTS   .DE $CF2B
                 5620 ROMS   .DE $CFFF
                 5630 SFTLFT .DE $CD02
                 5640 PRNT   .DE $CB0B
                 5650 FEED   .DE $CCAB
                 5660 WAIT   .DE $FCA8
9145- 00 00 00   5670 PIXBYT .BY 00 00 00 00 00 00 00
9148- 00 00 00
914B- 00
                 5680 ;
                 5690 ;WAIT 2 SECONDS FOR DISK DRIVE TO TURN OFF.
                 5700 ;
914C- A2 0D      5710 PRINT  LDX #13
914E- A9 FF      5720        LDA #255
9150- 20 A8 FC   5730 LOOP   JSR WAIT
9153- CA         5740        DEX
9154- D0 FA      5750        BNE LOOP
                 5760 ;
9156- AD FF CF   5770        LDA ROMS          ;SWITCH OUT CO-RES ROMS.
9159- AD 00 C1   5780        LDA SLOT          ;SWITCH IN PRINTER ROMS.
                 5790 ;
                 5800 ;SET LEFT MARGIN AT 8
915C- A9 08      5810        LDA #8
915E- 8D 11 CF   5820        STA LFMG
9161- 20 E3 91   5830        JSR CRLF
                 5840 ;
                 5850 ; PRINT OUT 400X399 IMAGE.
                 5860 ;
9164- A2 28      5870        LDX #C36334       ;INITIALIZE ROW ADRESS LOOP.
9166- A0 00      5880        LDY #N1
9168- 20 E3 8F   5890        JSR XTOY
916B- 20 E3 91   5900 FORN1  JSR CRLF
916E- A2 18      5910        LDX #C0   ;INITIALIZE BYTE COLUMN LOOP.
9170- A0 02      5920        LDY #D1
9172- 20 E3 8F   5930        JSR XTOY
9175- A2 00      5940 FORD1  LDX #N1   ;BYTE ADDR = ROW ADDR + BYTE COL.
9177- A0 02      5950        LDY #D1
9179- 20 60 8F   5960        JSR XPLUSY
917C- A2 08      5970        LDX #S1
917E- 20 B0 8F   5980        JSR ACCTOX
9181- CA         5990        DEX
9182- 20 F2 8F   6000        JSR XTOPTR
9185- A2 06      6010        LDX #6    ;GET COLUMN OF 7 BYTES.
9187- 20 D5 91   6020 LBL1   JSR GETBYT
918A- 9D 45 91   6030        STA PIXBYT,X
918D- CA         6040        DEX
918E- 10 F7      6050        BPL LBL1
9190- A0 07      6060        LDY #7    ;SHIFT OUT COLUMN TO DOTS AND PRINT.
9192- A2 06      6070 SHIFT  LDX #6
9194- 7E 45 91   6080 ROLAGN ROR PIXBYT,X
9197- 2E 2B CF   6090        ROL DOTS
919A- CA         6100        DEX
919B- 10 F7      6110        BPL ROLAGN
919D- 98         6120        TYA
919E- 48         6130        PHA
919F- 8A         6140        TXA
91A0- 48         6150        PHA
91A1- 20 0B CB   6160        JSR PRNT
91A4- 68         6170        PLA
91A5- AA         6180        TAX
91A6- 68         6190        PLA
91A7- A8         6200        TAY
91A8- 88         6210        DEY
91A9- 10 E7      6220        BPL SHIFT
91AB- A2 02      6230 NEXTD1 LDX #D1
91AD- 20 BE 8F   6240        JSR INCREX
91B0- A2 2E      6250        LDX #C49          ;DONE WITH COLUMN LOOP?
91B2- A0 02      6260        LDY #D1
91B4- 20 81 8F   6270        JSR XMINUY
```

Listing 3 continued.

Listing continued.

```
91B7- 10 BC     6280        BPL FORD1         ;IF NO, BACK TO FORD1.
91B9- A2 00     6290 NEXTN1 LDX #N1
91BB- A0 2C     6300        LDY #C350
91BD- 20 81 8F  6310        JSR XMINUY
91C0- A2 00     6320        LDX #N1
91C2- 20 B0 8F  6330        JSR ACCTOX
91C5- A2 00     6340        LDX #N1   ;DONE WITH ALL SETS OF 8 ROWS?
91C7- A0 2A     6350        LDY #C16734
91C9- 20 81 8F  6360        JSR XMINUY
91CC- 10 9D     6370        BPL FORN1
91CE- AD FF CF  6380        LDA ROMS
91D1- AD 00 C1  6390        LDA SLOT
91D4- 60        6400        RTS
                6410 ;
91D5- 38        6420 GETBYT SEC       ;DECREMENT ADDRESS POINTER BY 50.
91D6- A5 06     6430        LDA *MAPPTR
91D8- E9 32     6440        SBC #50
91DA- 85 06     6450        STA *MAPPTR
91DC- B0 02     6460        BCS CARSET
91DE- C6 07     6470        DEC *MAPPTR+1
91E0- B1 06     6480 CARSET LDA (MAPPTR),Y
91E2- 60        6490        RTS
                6500 ;
91E3- A9 04     6510 CRLF   LDA #4
91E5- 20 AB CC  6520        JSR FEED
91E8- 20 02 CD  6530        JSR SFTLFT
91EB- 60        6540        RTS
                6550        .EN


LABEL FILE:  [ / = EXTERNAL ]


/NUMVAR=000C           VARSTO=8DEE            /N1=0000
/D1=0002               /D2=0004               /D3=0006
/S1=0008               /S2=000A               /A1=000C
/A2=000E               /X0=0010               /Y0=0012
/X1=0014               /Y1=0016               /C0=0018
/C1=001A               /CM1=001C              /C398=001E
/C399=0020             /C16384=0022           /C36333=0024
/C7=0026               /C36334=0028           /C16734=002A
/C350=002C             /C49=002E              /VARPTR=0069
/MAPPTR=0006           DPACC=8E1E             BITMAP=8E20
LIDRAW=8E28            LABEL1=8E79            LABEL2=8E93
LABEL3=8ECD            LABEL4=8EE4            CONT=8EFF
PTDRAW=8F59            XPLUSY=8F60            RTN1=8F80
XMINUY=8F81            RTN2=8FA1              SIGNX=8FA2
RTN3=8FAF              ACCTOX=8FB0            INCREX=8FBE
SIGNFL=8FC9            DECREX=8FCE            SIGNF1=8FDE
XTOY=8FE3              XTOPTR=8FF2            GETBAS=9000
STORPT=901D            PUTBAK=902A            DPLOT=9037
NEXT0=9041             NEXT1=9049             NEXT2=9053
PLOTPT=905B            NOBIT1=90E2            NOBIT2=90ED
NOBIT3=90F8            CLSCRN=9112            LOOP8=9128
LOOP7=912E             CMPHI=9136             DONE7=9144
/SLOT=C100             /LFMG=CF11             /DOTS=CF2B
/ROMS=CFFF             /SFTLFT=CD02           /PRNT=CB0B
/FEED=CCAB             /WAIT=FCA8             PIXBYT=9145
PRINT=914C             LOOP=9150              FORN1=916B
FORD1=9175             LBL1=9187              SHIFT=9192
ROLAGN=9194            NEXTD1=91A8            NEXTN1=91B9
GETBYT=91D5            CARSET=91E0            CRLF=91E3

//0000,91EC,91EC
```

Summary and Conclusions

The set of graphics routines discussed in this article allow Apple II users who own Silentype printers to draw lines and plot points on an array of 400 × 399 pixels. The block of memory used for storing the image lies between addresses 16384 and 36333. The program has been assembled in Listing 3 to lie between addresses 36334 and 37355. The four subroutines that can be called from Applesoft Basic are as follows: LIDraw, address 36392, draws a line between starting-point coordinates X0%,Y0% and end-point coordinates X1%,Y1%, all four of which variables must be defined (in order) at the start of a program; PTDraw, address 36697, plots a point at coordinates X0%,Y0%; CLSCRN, address 37138, clears the graphics memory; and Print, address 37196, plots the image on a Silentype thermal printer. Before calling these routines, the user must BLoad them into memory and initialize the printer.

One of the drawbacks of the method used here is the large amount of memory used, about 21K bytes for the graphics memory and software. It would be interesting to modify the program to work with, say, 32K of outboard RAM. This would allow construction of images on a 512 × 512 array without the loss of any significant amount of program memory. As far as previewing the image before printing, you could write a program to transfer pieces of the image into one of the high-resolution graphics pages, perhaps including a scrolling feature so the user could scan the entire picture. Finally, as far as the actual printing goes, it would be handy to have printer graphics dumps for some of the popular impact printers. ■

Paul C. Schubert is a senior physicist with 3M Company, St. Paul, MN. Among his hobbies are canoeing, backpacking and photography.

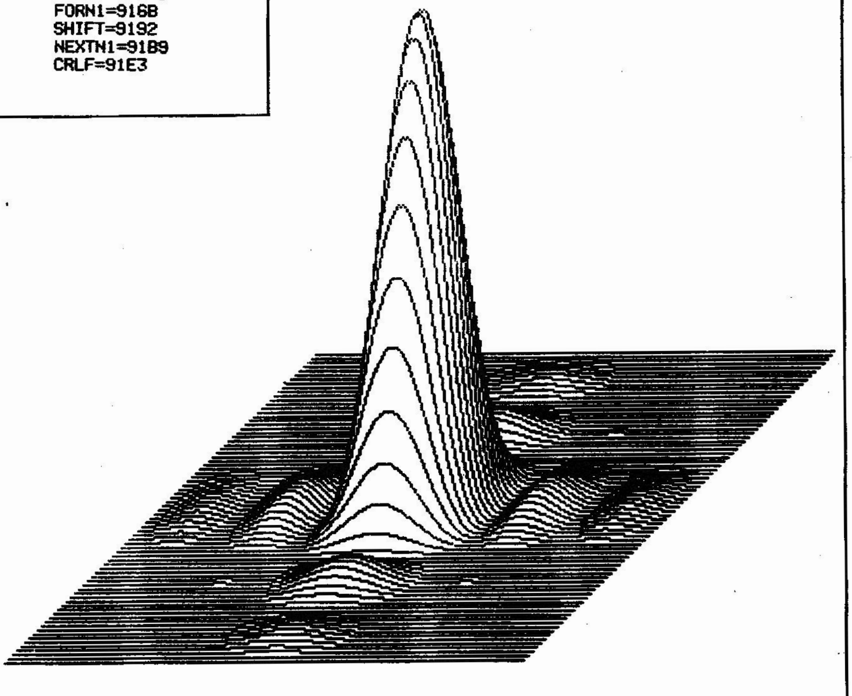

Figure 4. Diffraction intensity pattern from square aperture made using programs in Listings 2 and 3.

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Screen Revelations

A simple program that displays a great deal of information—ASCII, screen division and lowercase—without hassle!

by Winfield H. Edwards

This program (see the listing) is written in Applesoft on an Apple II Plus computer with 48K memory and a 16K RAM board. Those of you who do not have a 16K RAM board or the Apple Integer board will find the systems run just fine, all else being equal.

The program demonstrates vertical division of the monitor screen into three parts. This arrangement will maintain uniform brightness from top to bottom of the screen.

```
10  CALL  - 936: FOR X = 0 TO 255
     : FOR I = 1024 TO 2039 STEP
     44: POKE I,X: NORMAL : VTAB
     18: PRINT  TAB( 1)"ASCII#->"
     ; TAB( 9) PEEK (I)
20  INVERSE : IF X >  = 0 THEN  PRINT
     "INVERSE:0": NORMAL
30  FLASH : IF X >  = 64 THEN  PRINT
     "FLASH:  64": NORMAL
40  IF X >  = 128 THEN  PRINT "CO
     NTROL:128"
50  IF X >  = 160 THEN  PRINT "NO
     RMAL: 160"
60  IF X >  = 224 THEN  PRINT "LO
     CASE: 224"
70  IF X = 256 THEN 100
90  NEXT : NEXT
100  VTAB 23: HTAB 18: PRINT "END
     "
200  FOR A = 1 TO 5000: NEXT : GOTO
     220
220  LIST
```

Program listing. Program displays the ASCII chart, screen divisions and lowercase.

Refer to the *Apple Reference Manual*, page 15. The ASCII character table there is divided into five parts: inverse, flashing, control, normal and lowercase. Note the alphabet is shown four times, as are many of the other symbols. Every one of these characters is assigned two numbers, one hex and one decimal; the decimals are used here. There are 255 numbers, and they form the basis of the loop FOR X = 0 TO 255.

Turn to page 15 of the reference manual. Here, the screen is mapped and 960 locations are identified. This is the basis for the second loop, FOR I = 1024 TO 2039.... If this loop were used as written here, it would take an hour or more to run this program, filling the screen with each character. Add step 44 to the loop statement and speed is increased significantly. However, only one line will represent each of the three screen divisions, and eight locations on each line will display the same character, but not at the same instant.

The value of X is loaded into I with a Poke statement, and is displayed on the screen with a Peek statement.

This program displays the contents of the ASCII chart, screen division and lowercase. Lowercase is displayed as numbers, punctuation and symbols on the CRT. This Mixmax will produce clean copy using a suitable printer and word processor. ■

Address correspondence to Winfield H. Edwards, 300 Firwood Drive, Grants Pass, OR 97526.

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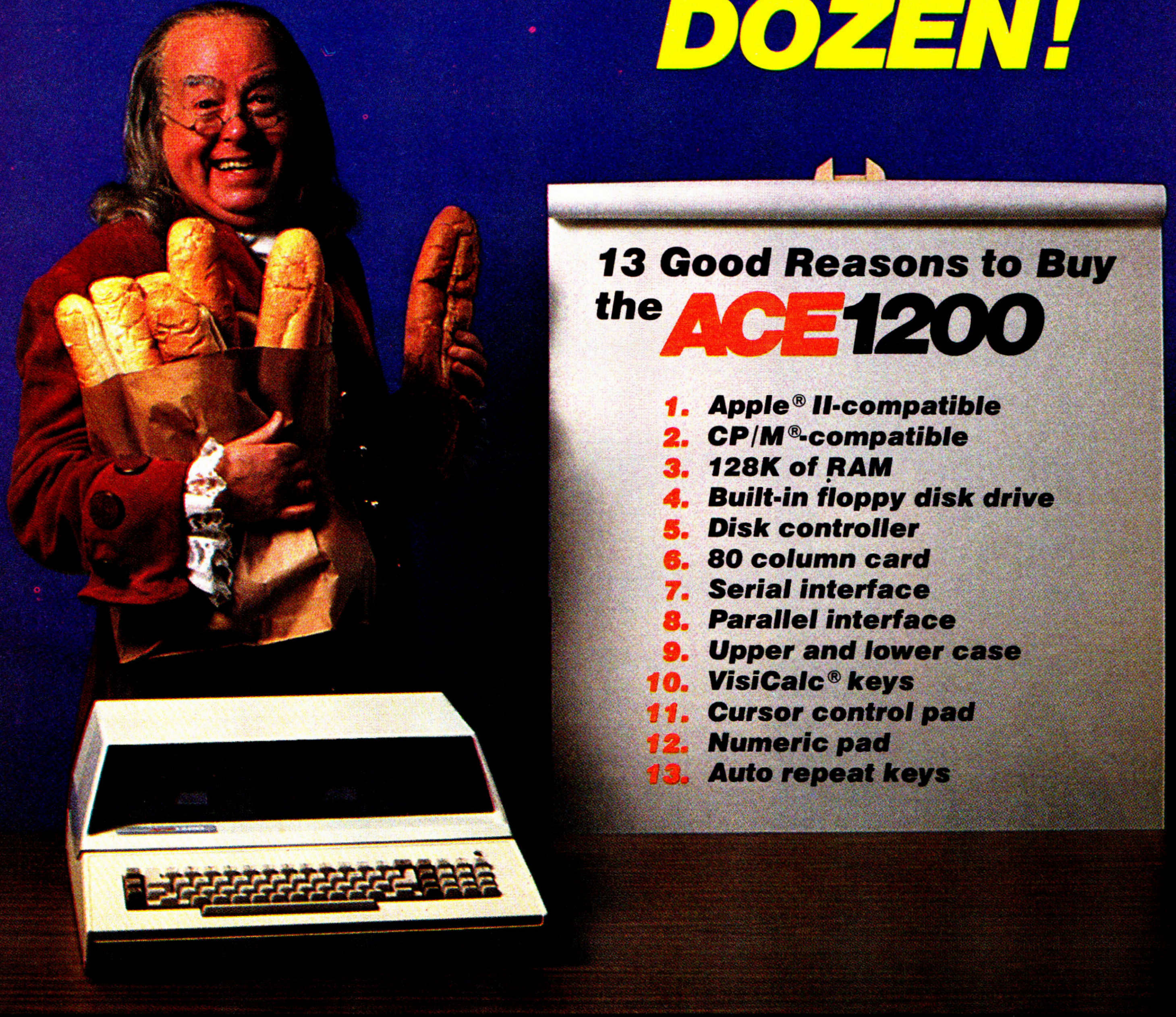

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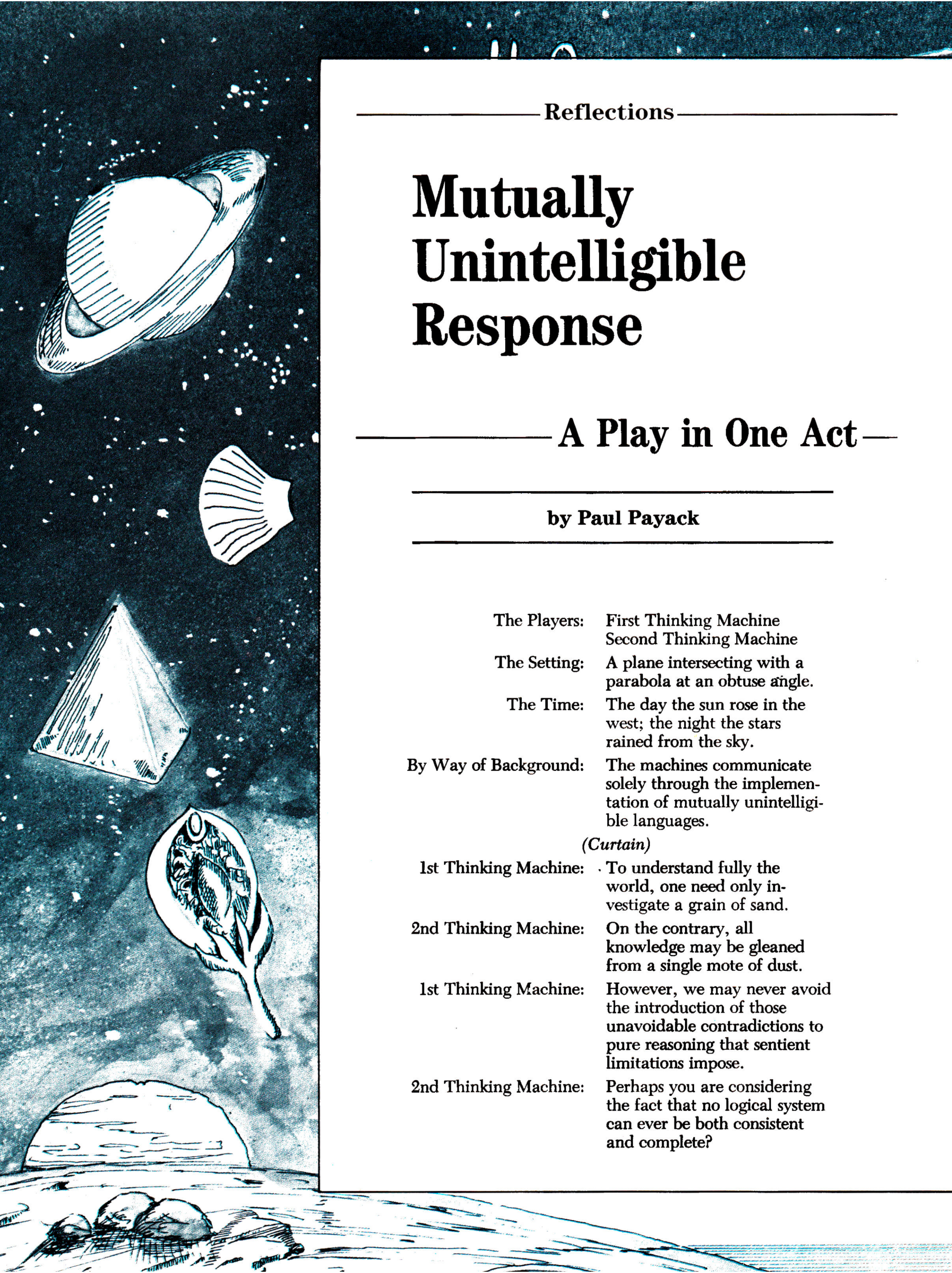


Reflections

Mutually Unintelligible Response

A Play in One Act

by Paul Payack

The Players: First Thinking Machine
Second Thinking Machine

The Setting: A plane intersecting with a parabola at an obtuse angle.

The Time: The day the sun rose in the west; the night the stars rained from the sky.

By Way of Background: The machines communicate solely through the implementation of mutually unintelligible languages.

(Curtain)

1st Thinking Machine: To understand fully the world, one need only investigate a grain of sand.

2nd Thinking Machine: On the contrary, all knowledge may be gleaned from a single mote of dust.

1st Thinking Machine: However, we may never avoid the introduction of those unavoidable contradictions to pure reasoning that sentient limitations impose.

2nd Thinking Machine: Perhaps you are considering the fact that no logical system can ever be both consistent and complete?

1st Thinking Machine: Gödel's Theorem.

2nd Thinking Machine: Of this I remain unacquainted.

1st Thinking Machine: Introduced some time ago by a carbon-based life form.

2nd Thinking Machine: *Id quod menti objicitur.*

1st Thinking Machine: This eludes me.

2nd Thinking Machine: It eludes us all.

1st Thinking Machine: What, then, can be known?

2nd Thinking Machine: That which is exclusive of a non-knowing being.

1st Thinking Machine: A rock, a photon, a gas giant, a seed, a candle, an argon atom, a slither of glass, or the wind?

2nd Thinking Machine: Precisely.

1st Thinking Machine: What of this ability to know?

2nd Thinking Machine: The Known.

1st Thinking Machine: That ability of a knowing consciousness?

2nd Thinking Machine: The Knower.

1st Thinking Machine: And consciousness?

2nd Thinking Machine: The act of the Knower knowing.

1st Thinking Machine: Then knowing is, simply put, a process or an interaction. . .

2nd Thinking Machine: The act of interacting with a thing (or a similitude thereof).

1st Thinking Machine: The intermixing of consciousness with the stuff of the world.

2nd Thinking Machine: *Quod quid est:* the *quidditas*, whatness, or essence, if you prefer.

1st Thinking Machine: And the Knower?

2nd Thinking Machine: The Knower knows all things.

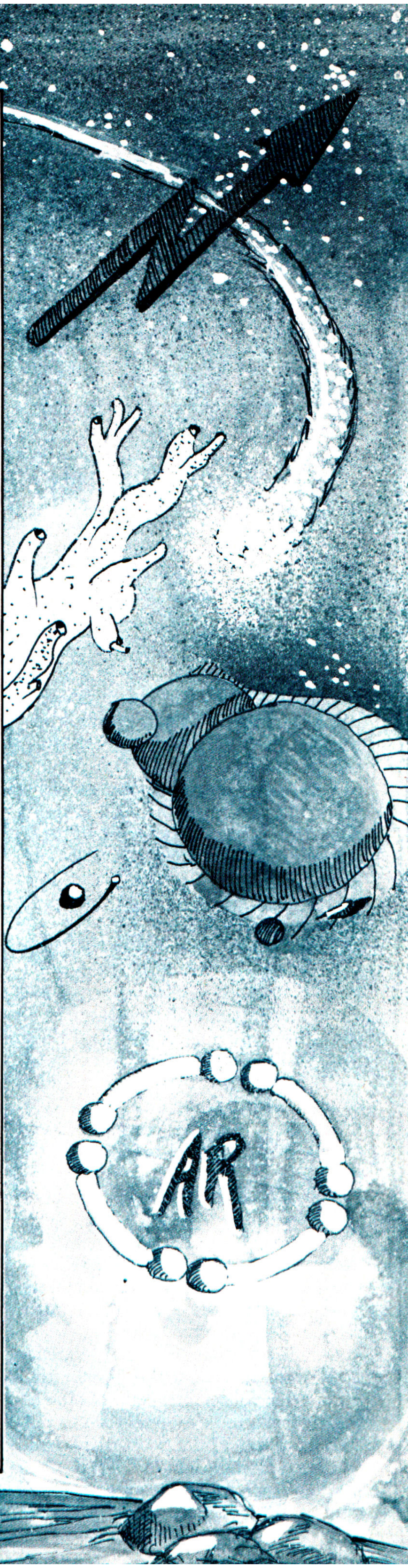
1st Thinking Machine: The Knower knows the entire plenitude of reality.

2nd Thinking Machine: The Knower knows the limitless number of beings all reflecting the infinite essences of whatness. (And, what is more, all this can be known by the Knower in a single thought.)

1st Thinking Machine: If he happens to be in close proximity to a grain of sand. . .

2nd Thinking Machine: Or a mote of dust.

(Exeunt)



A Soft Switch for Super Graphics

This quick fix for your Epson interface will turn you on graphically.

by James Reese

Epson manufactures a line of matrix printers that are attractive to Apple II owners. These printers feature a variety of print sizes and capabilities at good prices. The popular MX-80 includes among its capabilities the printing of a set of block graphics characters that complement TRS-80 screen graphics. Purchasers of Epson's Apple II printer interface board, however, quickly discover they can't print these graphics characters.

Epson offers a solution to this problem, along with bit-plot graphics capability and other enhancements, in a set of PROMs called the Graftrax 80 graphics option. Installing these PROMs in the MX-80 printer lets Apple II owners print the block graphics characters and control the printing of individual dots. This control lets you dump the Apple II hi-res screen to the printer.

You turn on block graphics printing by sending the printer a special set of characters. Ordinary characters subsequently sent to the printer are interpreted as block graphics characters. Another special set of characters turns off the block graphics printing.

Similarly, another special sequence of characters signals the printer that each of the following group of characters (bytes) is to be interpreted as a pattern of dots. The Epson print head consists of a single column of nine print needles. Each bit of a bit-plot graphics byte set to 1 will cause one of those needles to strike the paper. Since a byte has only 8 bits, only eight of the nine needles can be controlled. Bit 0 (the low-order bit) controls the needle that is second from the bottom of the print head. Bit 7 (the high-order bit) controls the top needle.

MX-80 owners who install the Graftrax 80 option discover that, while they can now use the block graphics characters, they cannot get the top print needle to strike when using the bit-plot graphics. What's going on here?

The Disappearing High-Order Bit

Figure 1 shows why Epson owners without the Graftrax 80 option cannot use the block graphics characters and why owners with this option cannot use the top needle in the print head. This figure shows how the Apple II's data lines are connected to the printer's data lines by the interface board. The interface buffers each of the Apple II data lines through a latch (¼ of a 74LS175 chip). The output of each latch is connected to one of the data lines going to the printer—except for bit 7. The output of the latch holding bit 7 goes nowhere. As shown in Figure 1 the printer line for bit 7 is connected to ground. The printer sees bit 7 as 0 no matter what value the Apple II puts on data line 7.

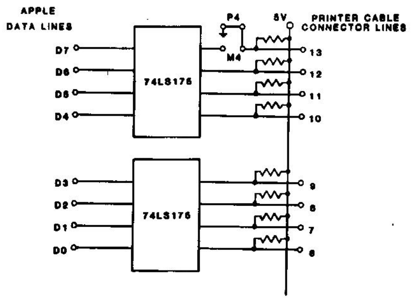


Figure 1. Connection of Apple II data lines to printer.

Why did Epson's engineers design the interface board so that bit 7 cannot be controlled by the Apple II? The answer comes from the bit patterns that the Apple II and the Epson printer use to represent the standard characters. The Epson printer uses a version of the ASCII character code in which bit 7 of the standard characters (upper- and lowercase letters, numbers, punctuation marks and control characters) is always set to 0. The printer uses bytes in which bit 7 is set to 1 to represent the block graphics characters. Of course if the Graftrax 80 option has been installed and the special bit graphics code has been sent to the printer, then bit 7 controls the top needle of the print head.

The Apple II uses a different set of

Address correspondence to James B. Reese, 107 Great Falls St., Falls Church, VA 22046.

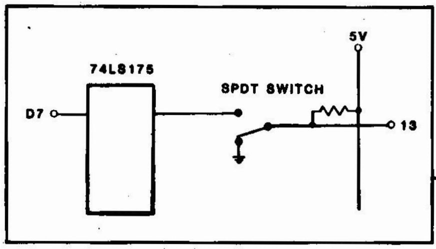


Figure 2.
Use of SPDT switch to control printer bit 7.

bit patterns to represent the standard characters. The Apple II text screen displays only uppercase letters, numbers and punctuation marks. Only six bits are needed to represent this set of characters. Bits 6 and 7 indicate whether the characters are to be displayed in normal, inverse or flashing mode. If bit 7 of a character is set to 1, then the character is displayed normally. If bit 7 is set to 0, the value of bit 6 determines whether the character is to be inverted or flashed. Because of this arrangement Applesoft Basic Print statements generate characters with bit 7 set to 1. These characters are passed to the Apple II monitor, which alters bits 7 and 6 according to the print mode (either normal, inverse or flashing). The modified character is then deposited in the Apple II's screen memory.

If the monitor sends a character to the printer because the output "hooks" have been changed (in Basic by a PR#n statement), then bits 6 and 7 of the character will be sent unaltered. If such a character is sent to an Epson printer, it will print a block graphics character instead of the desired letter, number or punctuation mark. Epson's solution to this problem was to "nail" bit 7 to a value of 0, so that characters generated by Basic Print statements would print properly.

Getting Control

In order to use the full capabilities of the MX-80, Apple II owners need a way to control the bit 7 value which is sent to the printer. When you want to print normal characters, bit 7 of the byte sent to the printer should be set to 0 regardless of the value placed on the Apple II bit 7 data line. When you want to print block graphics characters or use bit plot graphics, then the

Control Line Value	Apple II Bit 7 Data Line Value	Value Output to Printer
0	0	0
0	1	0
1	0	0
1	1	1

Table 1. Control line values and corresponding signal to printer.

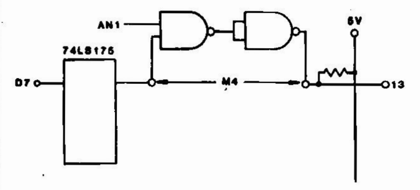


Figure 3. Replacing the SPDT switch with two NAND gates.

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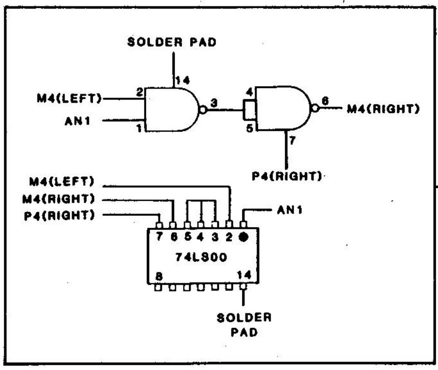


Figure 4.
74LS00 pin connections.

value of the bit 7 data line should be passed to the printer.

You can control bit 7 by installing a single-pole, double-throw (SPDT) switch between the output of the bit 7 latch and the bit 7 input line to the printer. Wire the switch so that when it is thrown one way the bit 7 latch output is connected directly to the printer input line. When the switch is thrown the other way, the printer input line is connected to ground (i.e., logic 0). (See Fig. 2.) This scheme is clumsy because you must throw the switch manually whenever you want to change from character printing to graphics or back.

A better approach is to install an "electrical" switch to replace the mechanical SPDT one. A logical AND gate provides exactly the desired capability. The output of the AND gate is connected to the printer input line. One input of the AND gate is connected to the bit 7 latch output, and the other input is connected to a control line. Table 1 shows how this line controls the value seen by the printer input line. As you can see, whenever the control line is set to a value of 0, a 0 is sent to the printer regardless of the value of the Apple II's data line. When the control line is set to 1, the value sent to the printer matches the value received from the Apple II's data line. This is exactly the same result as the SPDT switch produced.

"...all software that uses the printer will function normally..."

Now if we can find some way for the Apple II to set the value of the control line, we can control the use of printer bit 7 from software. The obvious way is to use one of the four annunciator outputs provided on the game connector. These single-bit outputs are controlled easily from both assembly language and Basic. Just connect one of the annunciator outputs to the AND gate input.

TTL (transistor-transistor logic) AND gates are available, but not from all retail suppliers. It is an easy matter, however, to connect two NAND gates to form an AND gate. Since NAND gates are readily available, and since normal packaging is four NAND gates on a single chip, this is the way to go. Figure 3 shows how to connect the NAND gates logically. Annunciator 1 (AN1 in the drawing) produces the control signal.

Heat Up the Soldering Iron

Installation of the NAND gate switch is simplified by Epson's provision of two sets of solder pads that control how printer bit 7 is connected. As shown in Figure 1, the set of pads labelled P4 causes printer bit 7 to be grounded while the set marked M4 connects bit 7 to the latch's output. The printer interface card is delivered with a small jumper wire connected

```
]LIST

1   REM **************************



3   REM * DEMO OF EPSON MX-80 BIT
      7 CONTROL *


5   REM **************************

6  REM
10  PR# 1: PRINT  CHR$ (9);"80N";
     : REM TURN OFF SCREEN ECHO
20  PRINT : PRINT  SPC( 15);
30  POKE 49243,0: REM BIT 7 ON
35  PRINT  CHR$ (188);: REM UPPER
      LEFT CORNER
40  FOR I = 1 TO 15: PRINT  CHR$
     (172);: NEXT : REM HORIZONTA
     L LINE
50  PRINT  CHR$ (180): REM  UPPER
      RIGHT CORNER
51  PRINT  SPC( 15); CHR$ (181); SPC(
     15); CHR$ (181)
55  PRINT  SPC( 15); CHR$ (181); SPC(
     15); CHR$ (181): REM "BLANK"
      LINE
60  PRINT  SPC( 15); CHR$ (181);:
      REM VERTICAL LINE
70  POKE 49242,0: REM BIT 7 OFF
80  PRINT "  EPSON MX-80  ";
90  POKE 49243,0: REM BIT 7 ON
100  PRINT  CHR$ (181): REM VERTI
     CAL LINE
105  PRINT  SPC( 15); CHR$ (181);
      SPC( 15); CHR$ (181): REM "
     BLANK" LINE
110  PRINT  SPC( 15); CHR$ (173);
     : REM LOWER LEFT CORNER
120  FOR I = 1 TO 15: PRINT  CHR$
     (172);: NEXT : REM HORIZONTA
     L LINE
130  PRINT  CHR$ (165): PRINT : REM
     LOWER RIGHT CORNER
140  POKE 49242,0: REM BIT 7 OFF
150  PR# 0

]
```

Program listing. *Test program for enhanced interface board.*

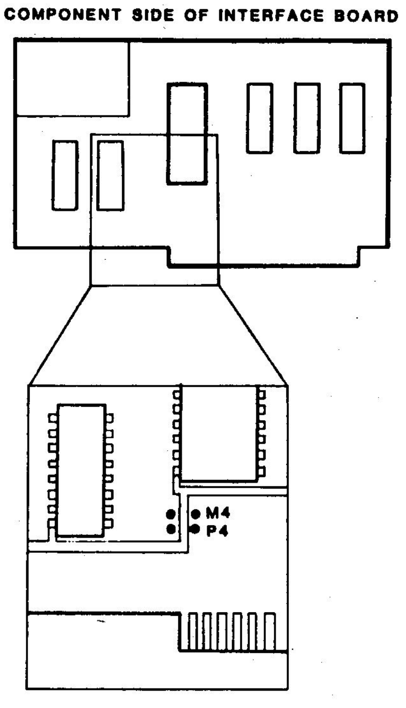


Figure 5. Locations of M4 and P4 solder pads.

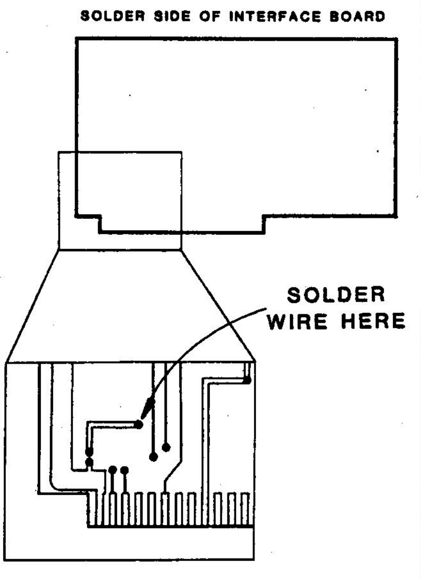
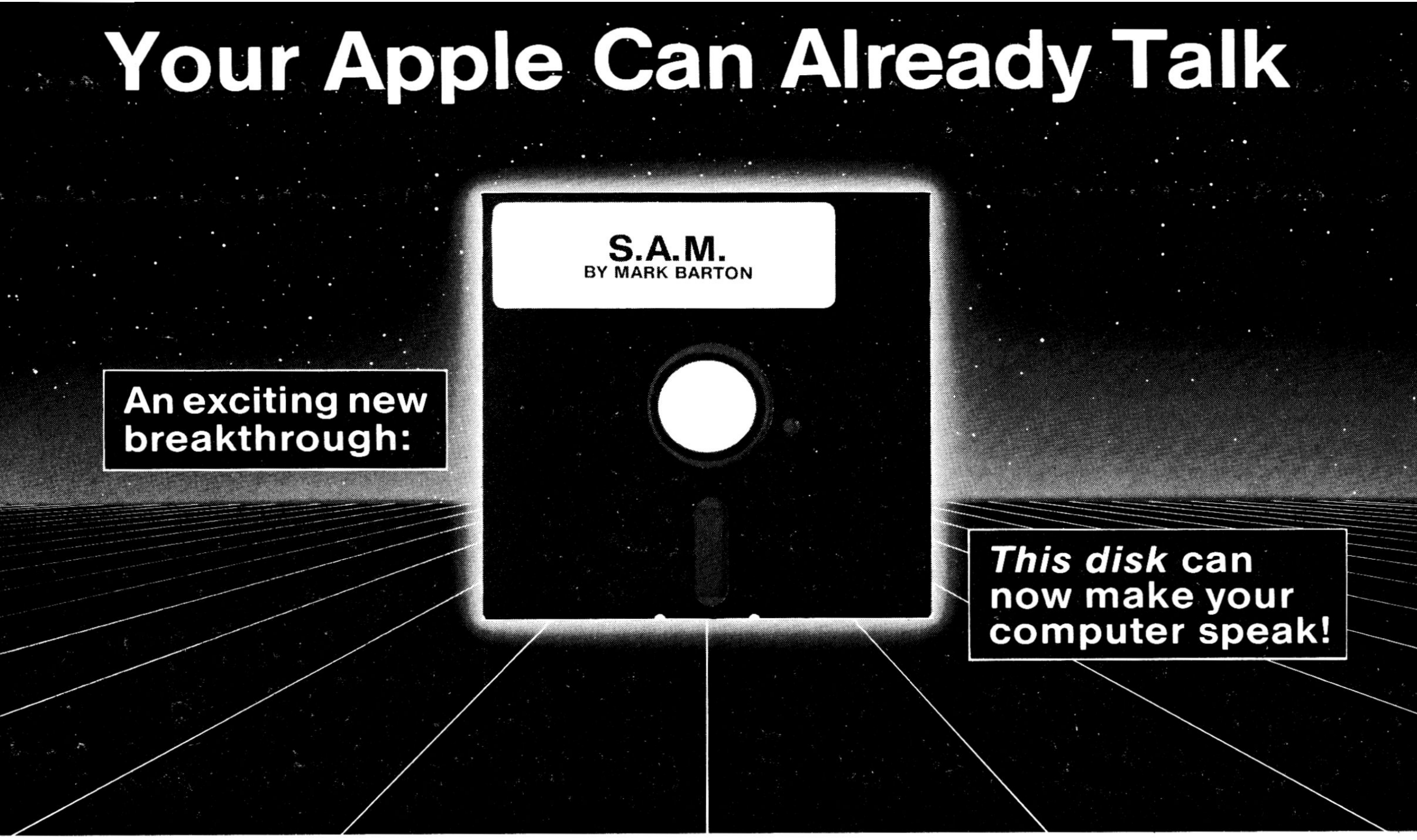


Figure 6. Location of +5 volt solder pad.

Your Apple Can Already Talk



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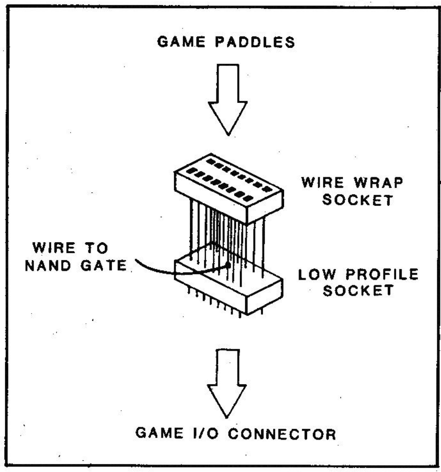


Figure 7.
Connection of control line to annunciator 1.

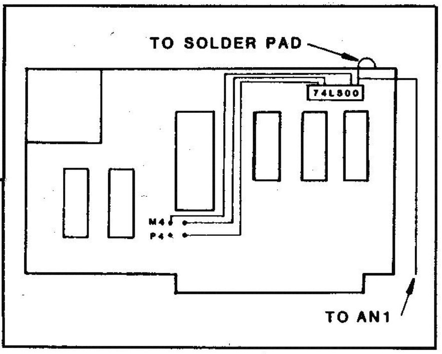


Figure 8.
Attachment of the 74LS00 to the board.

between the P4 solder pads. You can remove this wire easily by placing the tip of a hot soldering iron under it and lifting gently.

The chip containing the four NAND gates that should be used in this project is a 74LS00, available from Radio Shack (part number 276-1900) for 79 cents. Figure 4 shows both the logical and physical connections you must make to this chip. Rather than soldering directly to the chip's pins, connect the necessary wires to a 14-pin DIP socket (Radio Shack part number 276-1999), and insert the chip into the socket.

The location of pin 1 of the 74LS00 is often indicated by a small round depression on the top of the chip. Pins 3, 4 and 5 of the DIP socket should be soldered together by a small piece of wire beneath them. Be careful that you don't accidentally connect this wire to pins 2 or 6. Pin 2 should be connected by a wire to the left M4 solder pad, and pin 6 to the right M4 solder pad. Pin 7 must be connected to ground, and the right P4 solder pad provides the perfect location for this. The locations of these solder pads are shown in Figure 5. They are marked clearly on the front of the printer interface board itself.

Pin 14 of the 74LS00 chip must be connected to +5 volts. A convenient way to do this is to solder a wire to a solder pad on the rear of the printer interface board. The location of the required pad is shown in Figure 6. The wire should be brought up over the top of the printer interface board to the front side, to be connected to the 74LS00 chip socket.

> **"A better approach is to install an 'electrical' switch."**

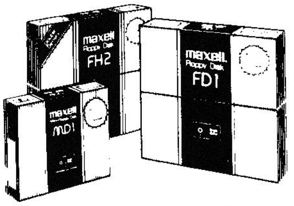
Finally, connect pin 1 of the socket to annunciator 1 of the Apple II game connector. (Annunciator 0 can also be used.) The easiest way to do this is to obtain a 16-pin low profile socket (Radio Shack part 276-1998) and a 16-pin wire-wrap socket (Radio Shack part 276-1994). Plug the wire-wrap socket into the low profile socket "piggy back," and solder a wire between pin 1 of the 74LS00 socket and pin 14 of the wire-wrap socket. Then plug the low profile socket into the game connector, and plug the Apple II game connector (or other connector) into the wire-wrap socket. This method of connection is shown in Figure 7. (The layout of the Apple II game connector is found on page 100 of the *Apple II Reference Manual.*) A little cellophane tape around the outside of the game connector may be needed to hold the low profile socket securely.

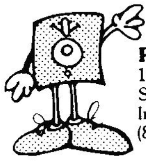
A good place for the 74LS00 chip is on the upper right corner of the printer interface board. I attached the *side* of the socket to the board with a small piece of double-sided tape. Some types of clear cement would probably work as well. The socket is placed with the pins pointing up. Pin 1 is located on the right side of the socket. Pins 1 through 7 are on the outside edge of the socket, while pins 8 through 14 are on the side closest to the interface board. Figure 8 shows how the wires connected to the socket can be laid out. The 74LS00 chip should be placed in the socket only after all soldering is completed.

The Software Interface

The program listing contains a short program that illustrates how bit 7 can be controlled from within a Basic program. This program prints the phrase "Epson MX-80" surrounded by a box produced by printing the appropriate block graphics characters. Use the program to test the NAND gate switch installation.

Note that the use of annunciator 1 (or 0) was not selected arbitrarily. Whenever the Apple II is turned on or reset, the Autostart ROM sets these annunciators to 0. This ensures that the Epson printer will function normally until a program (or immediate command) turns the annunciator on. So all software that uses the printer will function normally with no changes required. ■





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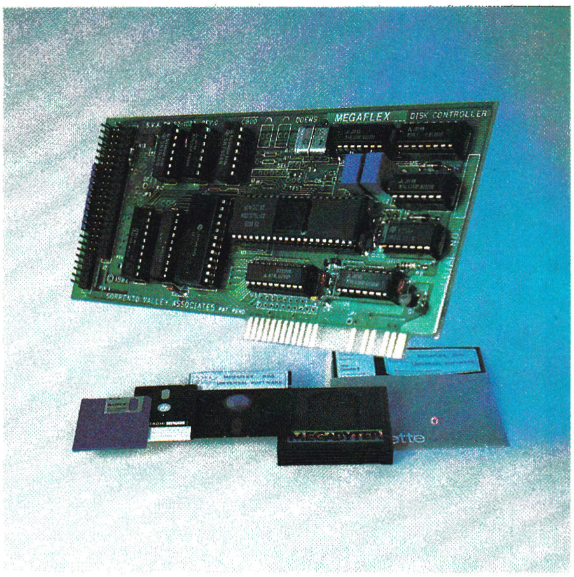

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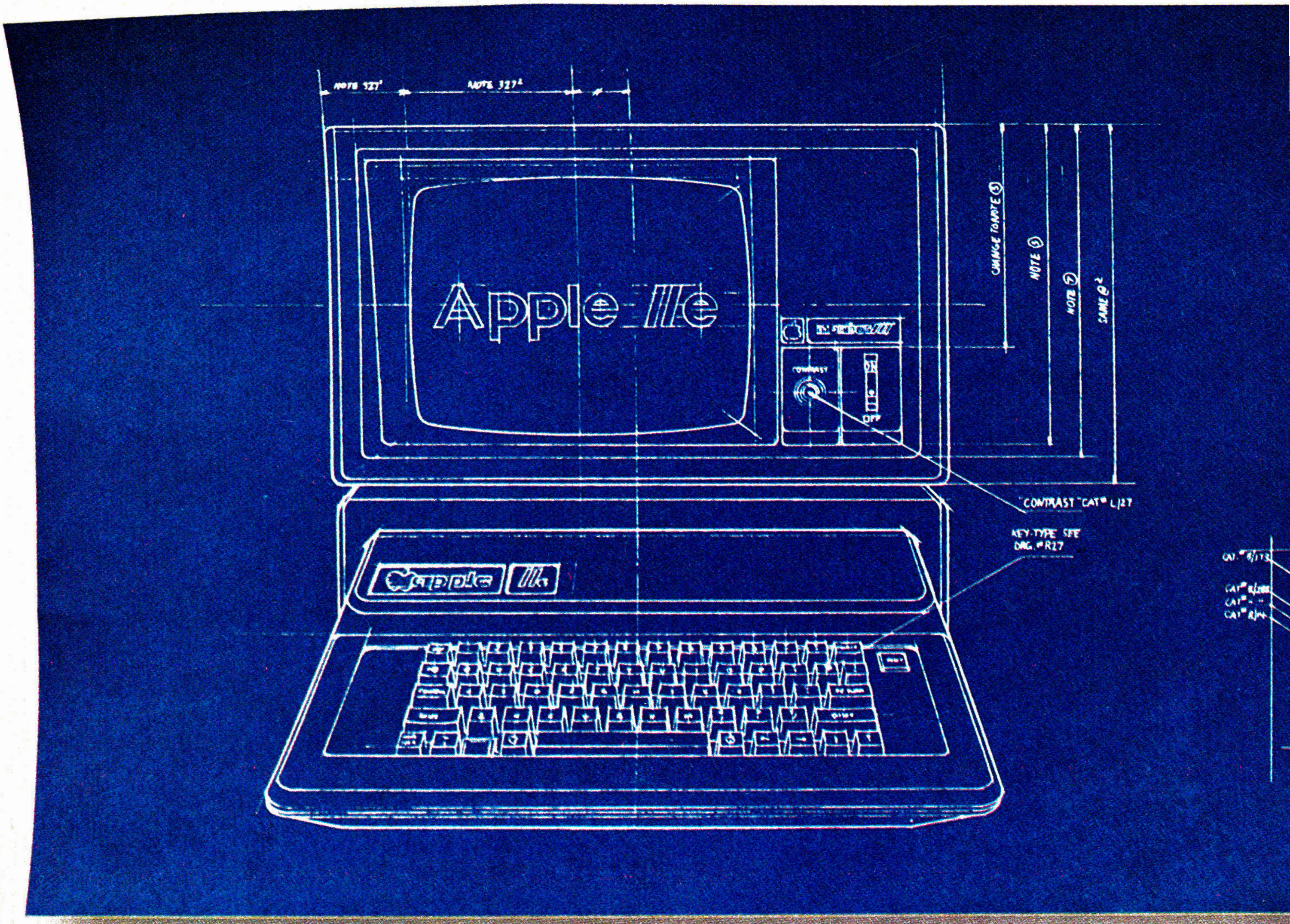

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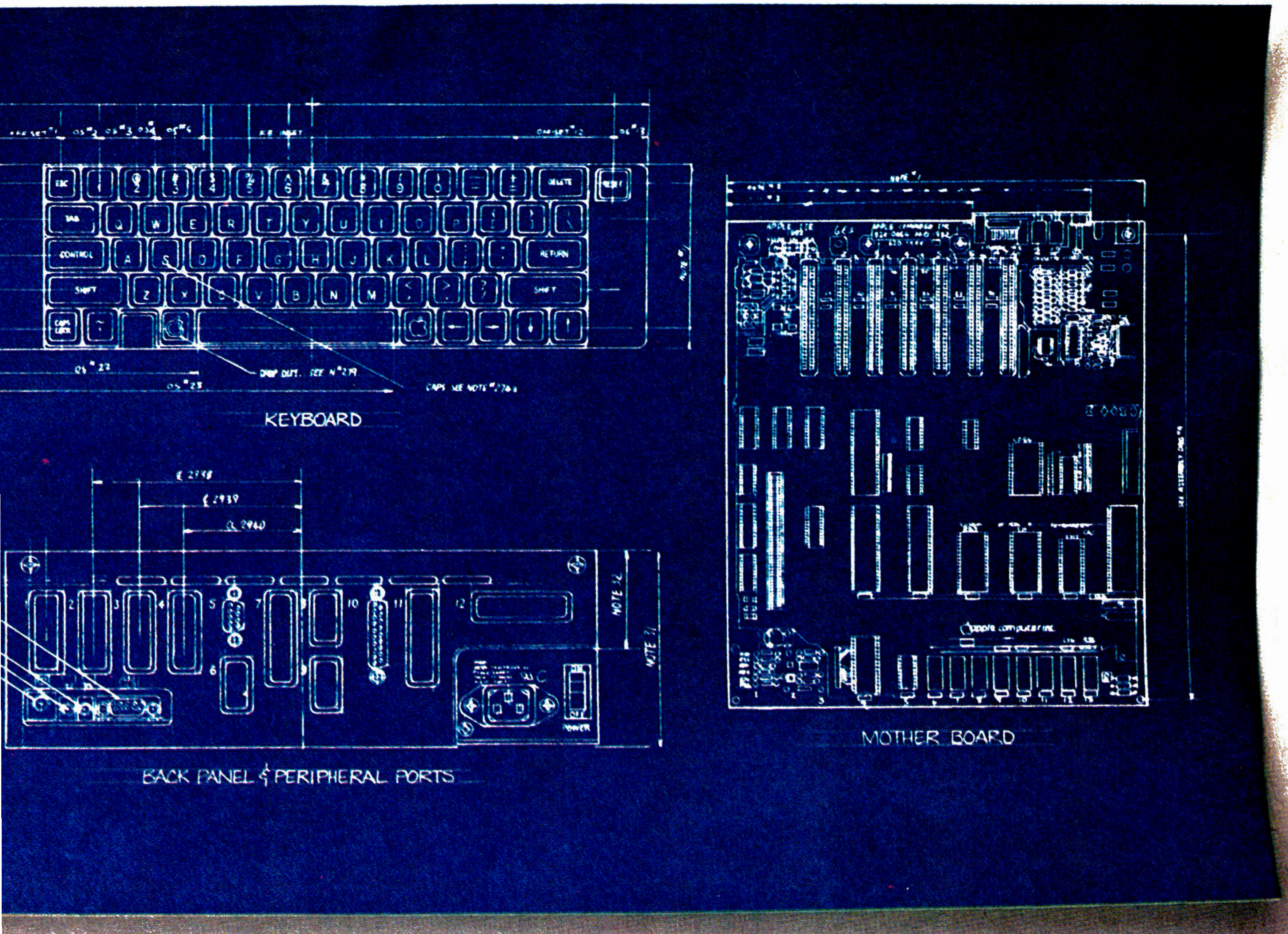

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Tutorial

Apple Data— A Bumper Crop

The Second Harvest

Here is the second of a three-part series that explains all you'll ever need to know about speeding up your file searches. No strings attached...

by Peggy Burnett

Last month in Part 1 I described several ways to find a particular record in sequential files and discussed the advantages and disadvantages of each method. This month I'll take a look at direct access files, and the next article in the series will cover indexed files. Please note that you usually can't use the direct access techniques discussed this month on tape files, because of the tape files' sequential nature.

First of all, what is a direct access file? For the purposes of this article, a direct access file is one in which you can find the record you want in one (or only a few) disk accesses, instead of searching for it by reading several other records first, as you must in sequential files.

There are three types of direct access file that I'll consider here: the plain old ordinary direct access file, which is the fastest file of all for locating records; the linked list file, which is most often used in combination with other schemes; and the hashed file, which uses a formula to determine where your record is.

In this month's article, as in last month's, I'll use an algorithmic, or pseudo-programming, language in the listings, leaving it to you to translate them into your favorite programming language. I like to use algorithmic language because I find the logic flow much clearer than in many of the popular programming languages.

> **"This type of file may not be fancy, but it is fast!"**

The Plain Old Ordinary Direct Access File

This type of file may not be fancy, but it is fast! The idea is to let the *computer* assign the "key" or account number for every record, rather than having the user do it. The key is the value you use to specify the record you want. For example, employee social security number is a commonly-used key in payroll systems. Obviously, there are some applications for which this scheme won't work—you can't let your computer go around assigning new social security numbers to all your employees. But there are lots of good applications.

Here's how the plain-old-ordinary direct access file works. Whenever you add another record, the computer simply assigns as the key the physical location on disk where the record will be. This technique guarantees that whenever you ask for a record by its key value (its location) you'll get that record in only one access, no matter how large the file is. The algorithms to add a record to this kind of file and to retrieve it are shown in Listings 1a and 1b.

Accesses: Only one access to find your record.

Advantages: This method is fast, easy to program and does not use extra storage space.

Disadvantages: Since the computer assigns the key values, you can't access records with previously-existing or more "natural" key values, such as employee social security numbers in our payroll example above. Also, when several records are deleted from a file you can't compress the file to save disk space, since this would cause all the records' locations, and therefore their key values, to change.

Peggy Burnett is a partner in the computer systems consulting firm of Bulgren and Burnett, Inc., and specializes in applications of small computers. She holds an M.S. degree in computer science, and has been a data processing consultant to small businesses since 1972. Address correspondence to PO Box 1355, Lawrence, KS 66044.

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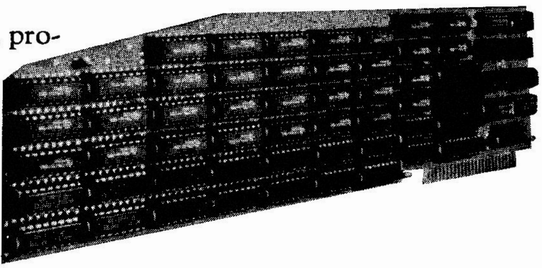

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```
PROCEDURE ADD;
/* This procedure adds a data record to a plain-old-ordinary
   direct access file.  */

   PRINT "TYPE IN THE DATA";
   CALL GET_AND_EDIT (RECORD_DATA);
      /* Call a routine to allow the user to type in the data for
         this record */

   CALL GET_AN_AVAILABLE_RECORD (REC_#);   /* One possible version of
                 this routine is given in Listing 2b   */

   WRITE RECORD_DATA  AT RECORD NUMBER REC_#;
   PRINT "KEY VALUE IS ",REC_#;

END ADD;
```

Program listing 1a. Adding to a plain-old-ordinary direct access file.

```
PROCEDURE RETRIEVE;
/* This procedure retrieves and prints out the desired data record
   in a plain-old-ordinary direct access file.  */

   INPUT "WHAT IS THE KEY OF THE RECORD YOU WANT?",REC_#;
   READ RECORD NUMBER REC_# INTO RECORD_DATA;

   PRINT "HERE IT IS:";
   PRINT RECORD_DATA;

END RETRIEVE;
```

Program listing 1b. Retrieving from a plain-old-ordinary direct access file.

```
PROCEDURE INIT_LIST;
/* Initializes a linked-list file of 1000 records. */
/* The first record contains information about the file, including the
   pointer to the beginning of the list.  */

RECORD_CODE = 0;
RECORD_DATA = '             ';   /* blanks */

   FOR REC_# = 2 TO 999 DO
      LINK = REC_# + 1;
      WRITE RECORD_CODE, RECORD_DATA, LINK  AT RECORD NUMBER REC_#;
   NEXT REC_#;

   /* The last one in the list has a link of '0', indicating
      that there are no more records in the list. */
   LINK = 0;
   WRITE RECORD_CODE, RECORD_DATA, LINK  AT RECORD NUMBER 1000;

   /* Now point record #1 to the beginning of the list */
   RECORD_CODE = 1;
   LINK = 2;
   WRITE RECORD_CODE, 'XYZ COMPANY', LINK  AT RECORD NUMBER 1;

END INIT_LIST;
```

Program listing 2a. Initializing a linked list file.

```
PROCEDURE GET_AN_AVAILABLE_RECORD (REC_#);
/* Returns the first available record from the linked list of available
   records.  This routine would be called from a routine like the
   'ADD' routine given in Listing 1a. */

   READ RECORD NUMBER 1 INTO REC1_CODE, REC1_DATA, LIST_START;
   IF LIST_START = 0 THEN
      BEGIN
      PRINT 'NO MORE ROOM IN THE FILE';
      STOP;
      ENDIF;

   REC_# = LIST_START;
   READ RECORD NUMBER REC_# INTO RECORD_CODE, RECORD_DATA, NEXT_AVAIL;
   LIST_START = NEXT_AVAIL;
   WRITE REC1_CODE, REC1_DATA, LIST_START INTO RECORD NUMBER 1;

END GET_AN_AVAILABLE_RECORD;
```

Program listing 2b. Getting a record from the linked list of available records.

One other disadvantage occurs if you choose to reuse the space freed up by a deleted record. Suppose you delete record 601, which contained information about John Jones, and reuse the space for Fred Smith's data. If your business partner then, looking at yesterday's master list, decides to change John Jones' address and modifies the data for key 601, Fred Smith's mail will start going to John Jones' house.

However, this disadvantage can be fixed by having your programs display the customer's name (or other appropriate field) whenever a user tries to update or delete a record. Or, you can make the key for John Jones 601-J, J being the first letter of Mr. Jones' last name. Then when he is deleted and Mr. Smith is added, Mr. Smith's key value (601-S) won't be the same as Mr. Jones' was.

Storage Allocation in A Direct Access File

Remember the sequential files we talked about last month? In such a file you just add to the end of the file to store more records. To delete records you can just mark them as deleted, and then every so often compact the file by copying only the non-deleted records to a new disk.

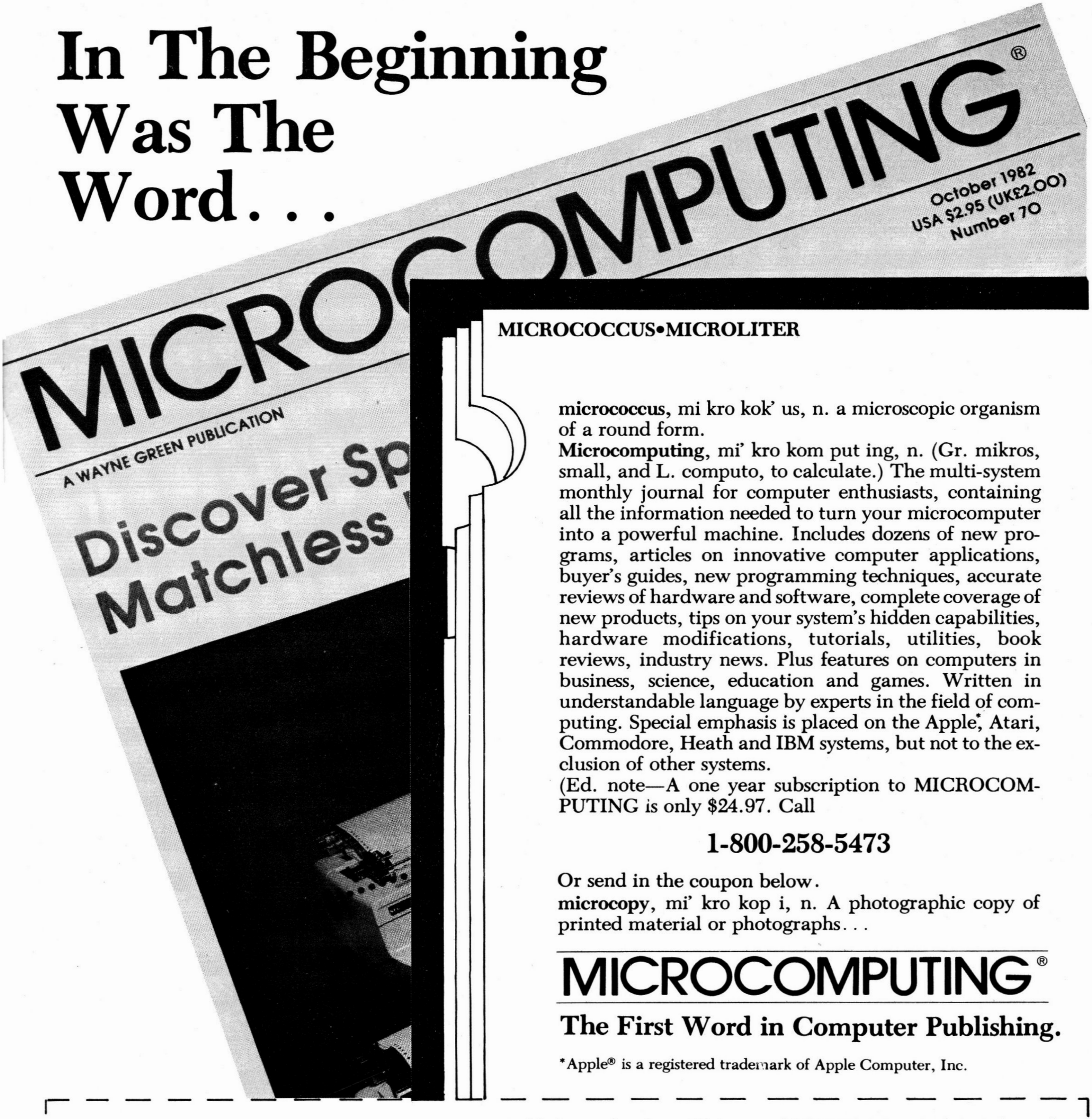
You can add new records to the end of a direct access file too. But, as I pointed out before, you can't compress the file to avoid wasting storage.

Another Way: The Linked List

The linked list is a way to organize your data in the order you need it. One particularly good application is in managing the available records in a direct access file.

Each record in a linked list consists of a record code field (that tells you what kind of record it is), the record's data and a "link" (pointer) to the next record in the list. You also need a beginning to your list, in an easily found place. I usually reserve record #1 in my file to store a pointer to the beginning of the list, and maybe other information about the file too, like the company name and address. There's a picture of a linked list in Figure 1.

In The Beginning Was The Word. . .



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In Figs. 2a through 2d the first field in each record is the record code. Available records are denoted by a record code of 0, the first record in the file has a record code of 1, and regular data records are denoted by record code 2.

Here's how to use a linked list to allocate records in a direct access file. First, before you input data, build (initialize) a file of about the right number of available records, all linked together. A diagram of this procedure appears in Figure 2a and the algorithm appears in Listing 2a.

Whenever you wish to add a data record to your file, just assign it the first record in the linked list of available records. This means you must remove that record from the linked list, leaving the one it pointed to as the new first one. The results of this maneuver are shown in Figure 2b where record #21 is the first available record, and the record it used to point to is record #32. Record #21 is removed from the list, making record #32 the new first available one, and #21 can now be filled with data. The algorithm is in Listing 2b.

When you delete a record the space it occupied can be returned to the linked list of available records (Figure 2c), making it the first one in line to be used when another data record is added. See Listing 2c for the algorithm.

Now remember, when you originally set up the file you had to guess how many records you would need. When in doubt guess too few, because it's easy to enlarge the file—just add more records to the list. Figure 2d shows the before and after versions of a file that had to be enlarged. The algorithm is given in Listing 2d.

The linked list has lots of other applications too. For example, you can use it to link together all of a particular account's transactions. In that application, every time a new transaction is entered you look up the customer record (using the plain-old-ordinary direct access method) and add the new transaction to the front of his transaction list. Each customer will have his own list of transactions, making interactive inquiry of his account easy to program and efficient to run. Refer to Figure 3 for a picture of this application.

The applications are endless. Linked lists can help avoid sorts (since they maintain things in the order you want them), can save search time and do not require much extra storage.

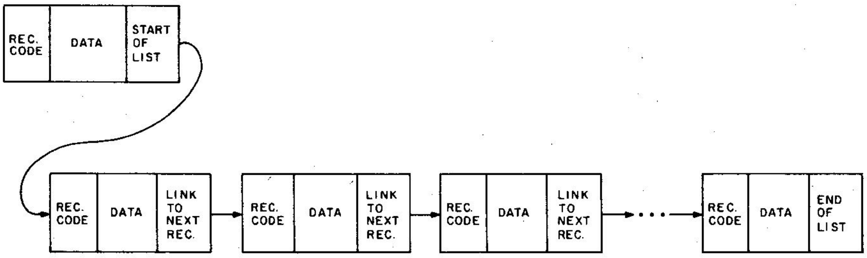

Figure 1. Representation of a linked list file.

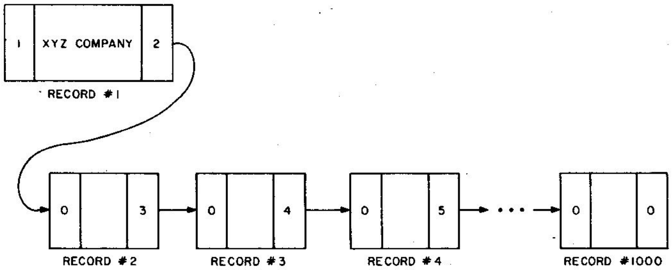

Figure 2a. Initializing a linked list file.

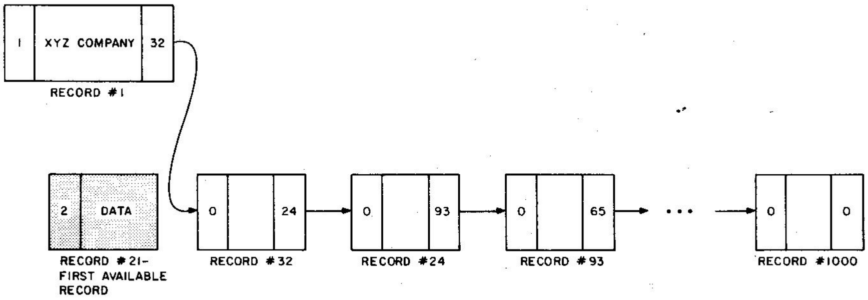

Figure 2b. Adding a data record, using the first record in the list of available records.

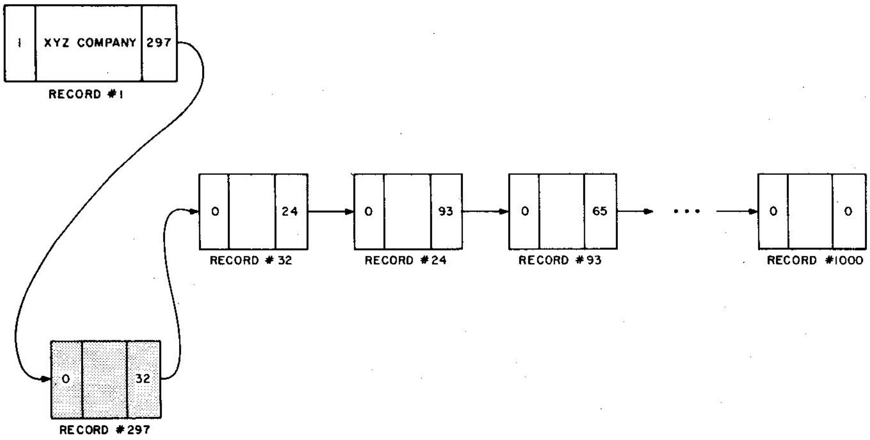

Figure 2c. Deleting a data record and returning it to the list of available records.

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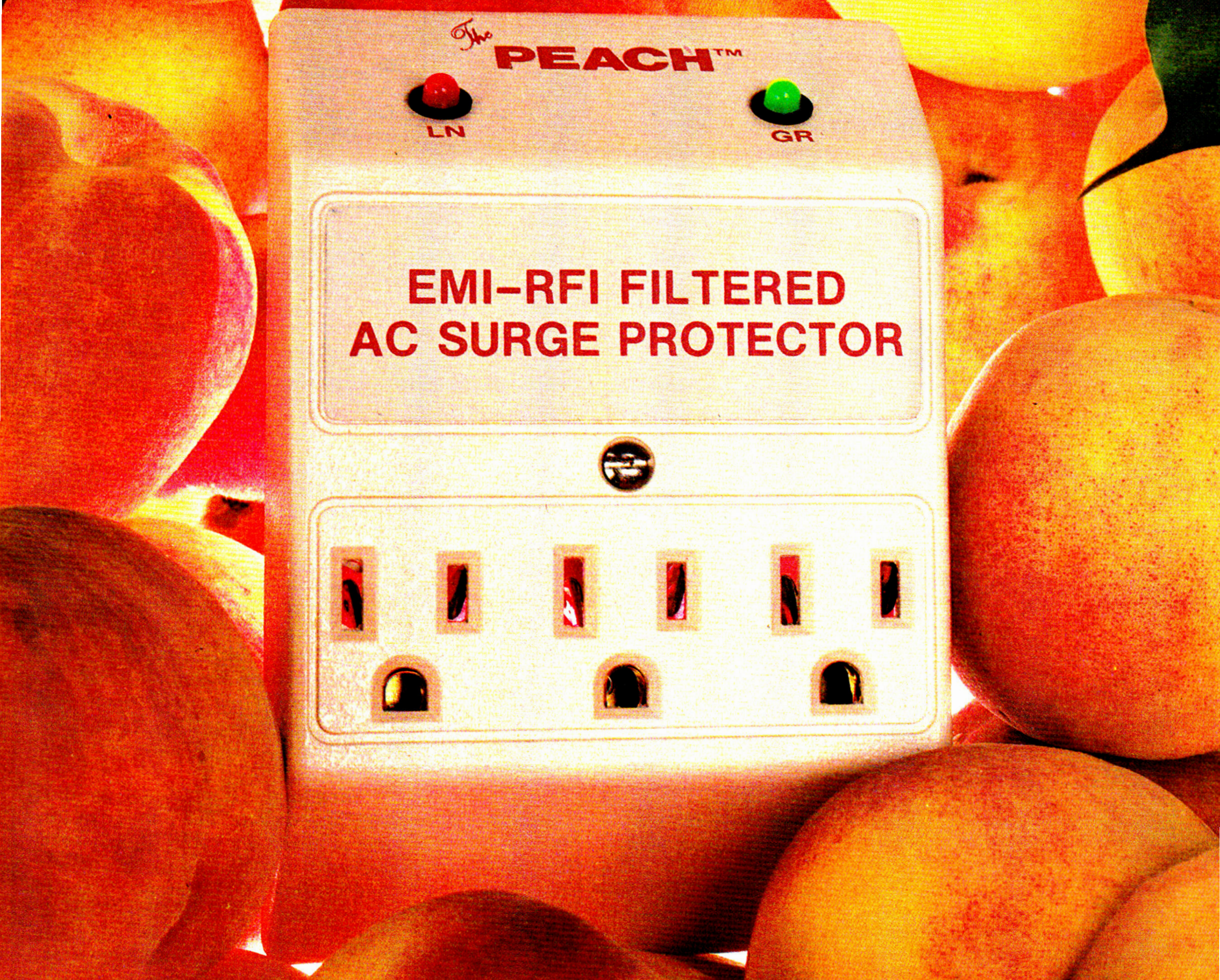

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```
PROCEDURE RETURN_RECORD (REC_#);
/* Returns a record to the list of available records */

   READ RECORD NUMBER 1 INTO REC1_CODE, REC1_DATA, LIST_START;

   /* Now make the data record an available one, and point
      it to the previous beginning of the list */
   RECORD_CODE = 0;
   RECORD_DATA = '           ';   /* blanks */
   LINK = LIST_START;
   WRITE RECORD_CODE, RECORD_DATA, LINK  AT RECORD NUMBER REC_#;

   LIST_START = REC_#;   /* The returning rec becomes the new
                            start of the list */
   WRITE REC1_CODE, REC1_DATA, LIST_START  AT RECORD NUMBER 1;

END RETURN_RECORD;
```

Program listing 2c. Returning a deleted data record to the linked list of available records.

```
PROCEDURE EXPAND_LIST (OLD_FILESIZE, NEW_FILESIZE);
/* Expands a linked-list file of available records */

RECORD_CODE = 0;
RECORD_DATA = '           ';   /* blanks */

   FOR REC_# = (OLD_FILESIZE + 1) TO (NEW_FILESIZE - 1) DO
      LINK = REC_# + 1;
      WRITE RECORD_CODE, RECORD_DATA, LINK AT RECORD NUMBER REC_#;
   NEXT REC_#;

   /* Point the last record we're adding to the previous start of
      the list, and make the new start of the list the 1st
      record we added. */
   READ RECORD NUMBER 1 INTO REC1_CODE, REC1_DATA, LIST_START;
   LINK = LIST_START;
   WRITE RECORD_CODE, RECORD_DATA, LINK AT RECORD NUMBER NEW_FILESIZE;
   LIST_START = OLD_FILESIZE + 1;
   WRITE REC1_CODE, REC1_DATA, LIST_START AT RECORD NUMBER 1;

END EXPAND_LIST;
```

Program listing 2d. Expanding a linked list file.

```
DEFINE FUNCTION HASH (KEY_VALUE);
/* This function takes a key_value of 10 characters, treats each
   character as a binary number, sums them up, divides by the
   filesize (1000 records), and returns the remainder */

   SUM = 0;

   FOR N = 1 TO 10 DO
      SUM = SUM + (BINARY VALUE OF N'TH CHARACTER OF KEY_VALUE);
   NEXT N;

   HASH = REMAINDER (SUM / 1000);

END HASH;
```

Program listing 3a. Hashing algorithm for numeric or alphabetic key values.

```
DEFINE FUNCTION MID_SQUARES (KEY_VALUE);
/* This algorithm takes the middle 3 digits of a 10-digit numeric
   key, squares that number, and takes the middle 3 digits
   of the result and squares it again.  The middle 3 digits of the
   final result is the record number returned.  */

   X = MIDDLE 3 DIGITS OF KEY_VALUE;

   FOR N = 1 TO 2 DO
      X = X ** 2;
      X = MIDDLE 3 DIGITS OF X;
   NEXT N;

   MID_SQUARES = X;

END MID_SQUARES;

/* For those of you who don't like the wording 'Middle 3 Digits of X'
   above, the formula:
      X = INT (X/1000) - [(INT (X/1000000)) * 1000]
   is equivalent.                                   */
```

Program listing 3b. A mid-squares hashing algorithm.

You can add a pointer to the end of the list so you can add new records there, too (Figure 4a). You can link a list in a circle so you can find the beginning of the list from any point in it (Figure 4b), and you can link it both forward and backward making it possible to traverse the list in either direction (Figure 4c).

But before you get too carried away with linked lists, let me point out that there are poor applications. One would be linking all your customer records together in alphabetical order, thereby eliminating alphabetical sorts. Just think about this for a minute. Every time you added a new customer you'd have to follow the links until you came to the right place for that person. This would average out to one half the length of the file. In other words, this would amount to the same as a sorted sequential file, except you couldn't even do a binary or interpolation search on it.

Accesses: When used properly, the linked list type of organization enables you to retrieve a record in only one access.

Advantages: It's fast and not difficult to program. The only extra storage required is a pointer field in each record—usually small enough to make little or no difference in the total number of records actually used.

Disadvantages: Unlike sequential and plain-old-ordinary direct access files, in which each record has no relationship to any other record, linked list records do point to others. (This is not unique to linked list files. Indexed files also have interrelationships between records.)

Linked List Rules

So what? Well, in theory this would be no problem. But the world of computers is not bug-free, and if bad things happen to one record, others may be affected. Whether the cause is a program bug, a loss of power or a disk error, many a sadder-but-wiser user will testify to:

Rule #1: That which is hooked together can become unhooked. Customer A can point over to the middle of Customer B's transactions, records can point to themselves, some records might even get lost (not be pointed at

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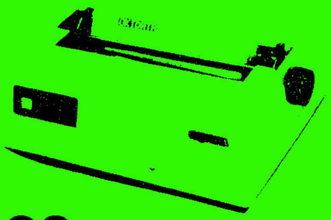

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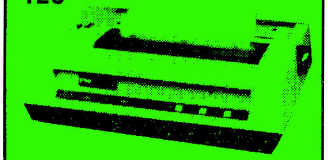

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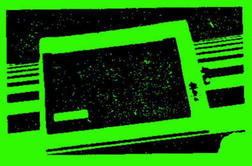

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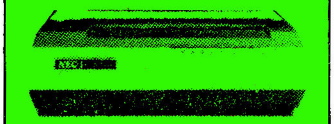

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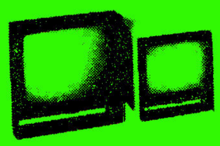

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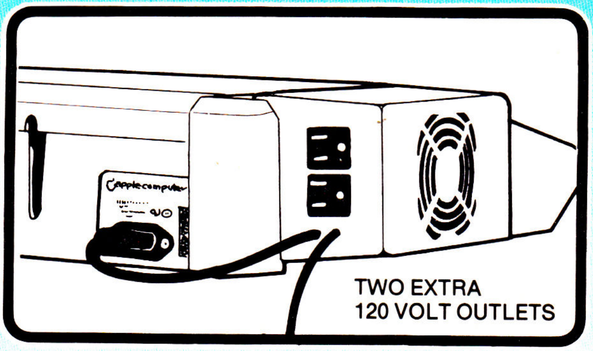

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by anything), and so on.

However, help is on the way in the form of:

Rule #2: Update your files in such a way that your existing records are protected. Let me illustrate. Consider the following algorithm:

1. Get record #1's pointer to the first available record.
2. Read the first available record.
3. Enter data into it and change its record code.
4. Write it back into the file.
5. In record #1, change the pointer to the next available record and write it back into the file.

This will work unless the power fails after step 4. In that case, the pointer in record #1 designates a record that is actually no longer available. When you bring the computer back up you'll have to find where the next available record really is and fix the pointer in record #1. You can avoid this problem by placing step 5 after step 2. This way you never, not even for an instant, allow any incorrect or incomplete links in your file. The worst that could happen in the event of a power failure or other disaster would be for the next available record to be removed from the list but not used—an event so minor it would never be noticed.

Rule #3: Check after every read to be sure the record you got is the one you expected. Available records should have a record code field that is different from the one used by transaction records, which in turn is different from that of customer master records. Storing the customer key value in every customer and transaction record will also help. These values can all be double-checked after every read to be sure you got the type of record you were expecting.

Sometimes, in spite of all your precautions, your links get into a hopeless tangle. This leads us to:

Rule #4: Back up your files religiously. By religiously I mean every day you use the disk. Then, should all else fail, you can restore from backup.

If you follow the above rules, you can have successful linked list files. And remember, these same rules are quite applicable to all files, no matter which type of organization you use.

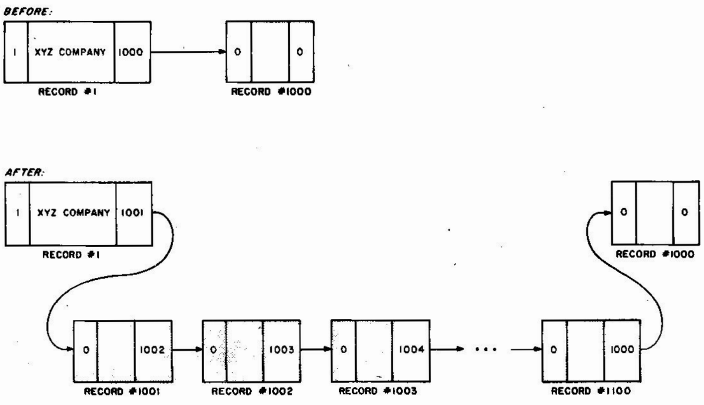

Figure 2d. Enlarging a linked list file.

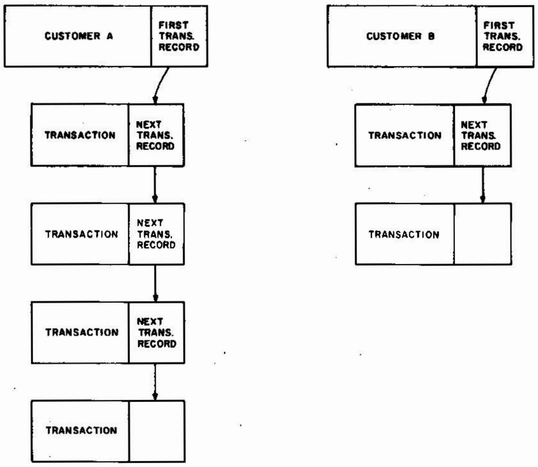

Figure 3. Linked list file of customer account transactions.

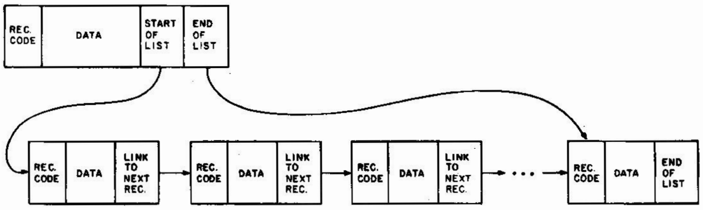

Figure 4a. Adding a link to the end of a linked list.

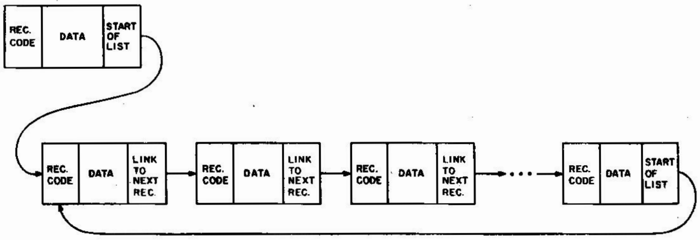

Figure 4b. Circular linked list.

Type of File	Comments	Average Number of Accesses In a 1000-record File If record is in the file.	 If record not in the file.
SEQUENTIAL FILES (see Part 1 of the series):			
Sequential search in an unsorted file.	Also suitable for tape files.	500	1000
Sequential search in a sorted file.	Also suitable for tape files.	500	500
Binary search in a sorted file.		11	11
Interpolation search in a sorted file.	Distribution of data in the file must be known. Principle can be adapted to some extent for tape.	5	5
Partitioned file (unsorted).		100*	200*
DIRECT ACCESS FILES:			
Plain old ordinary direct access file.	The computer assigns the key value.	1	1
Linked list.	Used to organize your records in the order you want them.	1 or more	1 or more
Hashed file.	A formula is applied to the key value to compute the record's location.	1½**	3**

* Assuming file is divided into

** Assuming file is ⅔ full of data. In this example, this means

Table 1. Summary of file access methods covered

The Hashed File

The hashed file is a direct access file in which you use a formula on the key value to determine the location of a record. This allows you to use "natural" key values, like employee name or social security number, instead of having to know the record number, as in the plain-old-ordinary direct access file. There are lots of variations of this method. I'll illustrate with a simple one.

Here's what you need for a hashed file:

- You need a formula to compute the location of a record based on its key value. We'll call this formula a hashing algorithm. Now, the ideal hashing algorithm would compute a different location for every different key value. Then you could always get the record you wanted in only one access. However, we usually can't achieve this goal without using ridiculous amounts of disk storage. So, if we can't have an ideal hashing algorithm, we'll settle for a good one.

  Good hashing algorithms distribute the records fairly evenly throughout the file. They usually include an arithmetic division by the number of records in the file. Three hashing algorithms that work well in most cases appear in Listings 3a, 3b, and 3c.
- Another thing you need for a hashed file is a way to determine if a location is presently filled with data. I like to use record codes for this purpose, just as in linked list files. This means you must initialize the file with the code for available record in every record. See Listing 4 for the simple algorithm.
- You need a way to handle the "hash clash." A hash clash happens when you compute the location to insert a record in your file, but that location is already full. One solution is to read

```
DEFINE FUNCTION MOD (KEY_VALUE);

   MOD = REMAINDER (KEY_VALUE / 1000);

END MOD;
```

Program listing 3c. The Mod hashing algorithm—the remainder of the key value divided by the number of records.

```
PROCEDURE INIT_HASHED_FILE;
/* Initializes all records in a 1000-record hashed file
   to 'available' */

   RECORD_CODE = 0;

   FOR REC_# = 1 TO 1000 DO
      WRITE RECORD_CODE AT RECORD NUMBER REC_#;
   NEXT REC_#;

END INIT_HASHED_FILE;
```

Program listing 4. Initializing the record codes of all records in a hashed file, signifying they are available for data.

Advantages	Disadvantages
1. Easy to program. 2. No extra storage needed.	1. Very slow.
1. Easy to program. 2. No extra storage needed. 3. Better than the sequential search in an unsorted file, if the record is not in the file.	1. Slow. 2. File must be sorted whenever additions are made.
1. Not difficult to program. 2. Quite fast. 3. No extra storage needed.	1. File must be kept sorted.
1. Fastest method for sorted sequential files. 2. No extra storage needed.	1. File must be kept sorted.
1. Easy to program. 2. File does not have to be sorted.	1. Extra storage may be needed.
1. Easy to program. 2. No extra storage needed. 3. Fast!	1. "Natural" keys can't be used. 2. Storage management may be more complex.
1. Very little extra storage needed. 2. Helps avoid sorts.	1. More precautions must be taken in programs to keep links from getting all tangled up.
1. Easy to program. 2. Fast.	1. Wastes storage space. 2. Cannot produce ordered reports without sorting first.

5 partitions of 200 records each.

that 1500 records would be needed to store 1000 records of data.

in Part 1 (last month) and in Part 2 (this month).

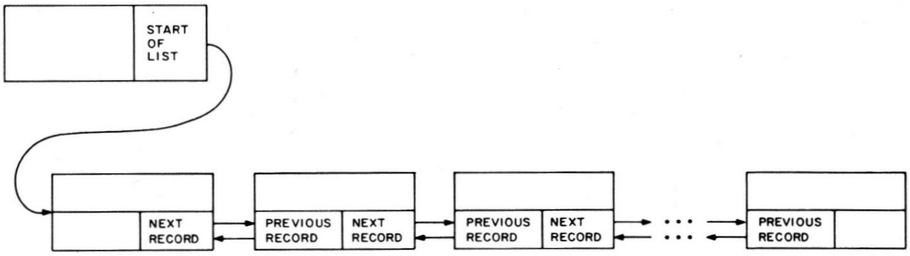

Figure 4c. Forward and backward linked list.

sequentially from that location until you do find an available location.

For example, suppose you have a 1000-record employee file, and you want to use social security number as the key. First, you use the algorithm in Listing 4 to initialize all 1000 records as available. Then, to add an employee to the file you apply a hashing algorithm to the social security number to determine where in the file to place that record. Later, to look up that same employee in the file, you apply the same hashing algorithm to the social security number again to find out where you put the record earlier.

In this example, let's use the Mod hashing algorithm (Listing 3c). If the social security number is 282-66-2472, the hashing function will compute: record # = remainder of (282662472/1000) = 472. So your employee's data goes into record #472.

Accesses: The ideal number of accesses is one. The actual number depends upon whether you choose a hashing algorithm that distributes your key values well, and how full of data the file is. A file 99% full of data is much more likely to have hash clashes than one that is only half full.

Advantages: A hashed file enables you to get to your record in one or at most a few accesses, but is still quite simple to program and maintain.

Disadvantages: Hashed files that get too full usually have too many clashes for efficient accessing. Thus, you should keep the physical file big enough to be only ⅔ to ¾ full. This results in a fair amount of wasted storage space—storing 1000 data records in a file ⅔ full would require 1500 records. Another disadvantage is that, although this kind of file organization can be very efficient for looking up individual records, the file must be sorted first to produce ordered reports such as alphabetical lists.

Summary

These direct access file organization techniques—the plain-old-ordinary, linked list and hashed—can produce very fast accesses for individual records, but often fall short in producing sorted reports. Next month, I'll talk about indexed files. ■

Fair Game

The San Francisco Applefest was a good example of what is good, and what is bad, about a computer fair.

by Hartley G. Lesser
Technical and Review Editor

Untimely. Decidedly so. The November 1982 San Francisco Applefest was held weeks ago. There were no major announcements, and what little new software was displayed is old hat by now. With COMDEX, a showcase of glitter and big money, only one week away, who could blame the exhibitors for remaining close-mouthed about their new products.

However, to ignore the SF Applefest would be a disservice. Regardless of its lack of flair, the exhibition was not to be missed. Why? The appellation 'fest denotes a happy gathering, and those Apple fans seemed to enjoy all four days. For hours at a time the walkways were clogged with computerphiles pressed close to see this demonstration, or grab that free poster or button. A spirit of amiability prevailed.

Unfortunately, this benevolence seemed not to include the 'fest operation. The callous behavior of "assistants," who demanded cash payments to unload vehicles laden with hardware and software, angered exhibitors weary from travel and eager to set up their wares. Those who refused to, or could not, pay the fee had to manage by themselves in the midst of a torrential downpour. In addition, they felt obliged to hush talk of water-ruined equipment, fearing damaged booths if the wrong person overheard their grumblings.

> **"...those Apple fans seemed to enjoy all four days."**

The lack of courtesy did not end there. Access to the lower exhibition area of Brooks Hall, the 'fest location, was via a large ramp, down which vehicles could be driven to an unloading point on the exhibition floor. Many exhibitors wished to take advantage of this access. Yet, when several cars used the rampway, a loudspeaker blared into life, threatening smashed windshields and headlights if the vehicles weren't quickly moved.

Upon arrival at their designated booth areas, some exhibitors found folding tables already in place. Thinking these tables were part of the original fee paid for the booth, they put them to use. Actually, this was nothing more than the old bait and switch routine—leave something in an area that originally had nothing, deceive the exhibitor into thinking he or she has already paid to use the item, and then charge an inflated price for its use later on, during the intensity of the fair. You can imagine the consternation of folk who had already paid thousands of dollars to exhibit at the show. One dealer was advised by a 'fest official that he could extend his booth into an adjoining vacant section. Due to the press of business, the exhibitor didn't. He was lucky, for he learned later there would have been an additional $900 charge had he done so.

I won't bother discussing the payments necessary for a booth to be taken down after the show closed. Also, exhibitors had to sit around, some for several hours, awaiting the official booth dismantlers to do their work. Many dared not even touch their booths during this time, for fear their booths at future shows would come to harm.

Then there was the software company, with a prominent position at the hall's entrance, demonstrating a very popular arcade game on a wide screen TV. Tucked away in the base of the TV projection system, where few would see it, was the Atari system used to run the game. Unfortunately, many believed this game to be the Apple version, and purchased the Apple version software in the belief that what they bought was what they had seen. There should have been a sign that it was the

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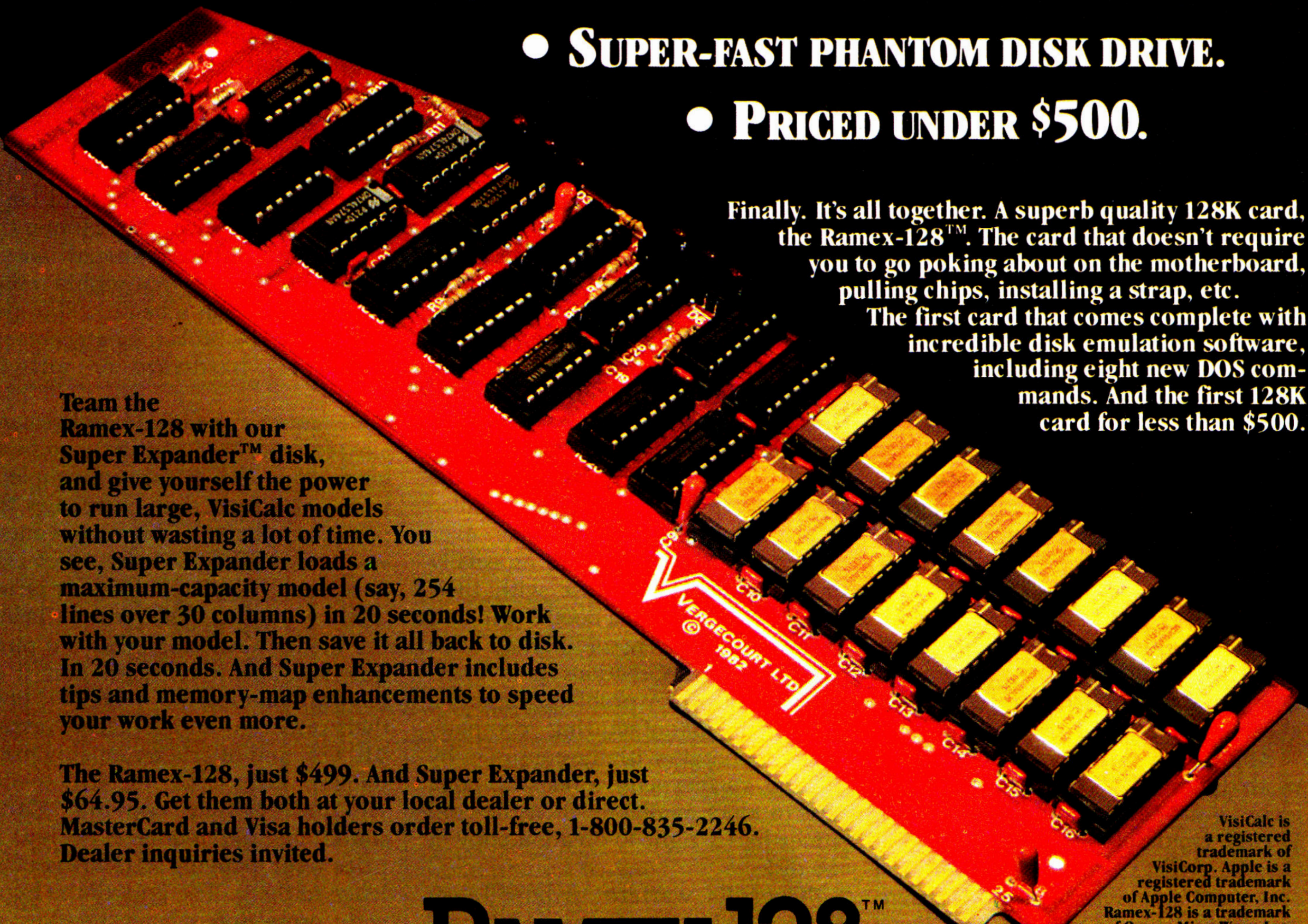

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Atari version being exhibited, or else *both* versions should have been running simultaneously. Perhaps a recent review of the Apple version explains why the company decided to follow this strategy at the 'fest.

Sound all bad? Not really. The 'fest's official hotel was probably the worst experience of all. There was a charge for parking, in addition to outrageous room prices, and the parking lots were situated anywhere from a half block to three blocks from the hotel entrance. To be quite honest, Mission Street in San Francisco is not the finest area to be walking in at night. The rooms all had Central Annoyance, consisting of pipes that wailed like bagpipes whenever hot water was drawn in an adjacent room. Plaster was peeling; and lost items were, strangely, never found.

But when the 'fest was open and rolling and the "peripherals" could be forgotten, it was a different world. One of the busiest booths cleaned eyeglasses, the better to see the exhibits.

Apple itself was there with a mammoth display. Two companies operated by young people, Mind Systems and Double Gold Software, were present. Graphic software packages from Accent Software, Avant-Garde, Hayden Software, Island Graphics and Penguin Software caught the browser's eye. Syntauri and Passport Designs musically entertained, while Savvy, Zardax and PFS were constantly besieged with inquiries. Broderbund, Budgeco, Highlands, Piccadilly, Renaissance, Sierra On-Line, Sunnyside Soft. . . all captivated the younger audience, with adventures playing across monitors, and a non-violent arcade game making its debut. Educational software was offered by a variety of companies, such as Cybernetics Logo, CompuWise, Kids Can Touch and Don't Ask Software.

A drive price war was apparent, with figures dropping into the $200 range for 5¼-inch floppy disk drives. A flood of visitors to the booths of companies like Corona and Santa Clara Systems verified the popularity of the hard-disk drives.

"The continuing controversy over piracy was hotly discussed. . ."

RAM boards, 8086 boards, 80-column boards. . . the exhibition was awash with them. No matter where you turned, you could find a special board that would do something absolutely marvelous for your Apple. Then there was CommSoft's Photocaster with the Epson MX-80 that prints in color, Synetik's new video interface. . . the list could stretch on for a good while.

The continuing controversy over piracy was hotly discussed, especially since East Side Software with their Wildcard board had a booth. (I'm told over 1000 units were sold!) Don Fudge of Avant-Garde Creations spoke briefly about the piracy problem. He stated that if a manufacturing company didn't cooperate with the consumer by making an inexpensive back-up copy of a product available, then the consumer had a right to create a copy of the disk.

"Guerrilla warfare" is how James Hunter of Hayden Software phrased the current state of affairs. Disk protection becomes more sophisticated, then the pirates upgrade their copying devices. . . and the cycle continues on and on. He added that application software shouldn't be protected. However, with the rate of return on game software so low to begin with, current protection methods must remain in force until a permanent method of protection is available. Hunter does not consider this a moral issue, but an economic one. He expressed great concern that all of these schemes ultimately hurt the consumer.

Gil Beyda of Mind Games, at 19 years old a company officer and creator of Desecration, feels the average end-user does not, and cannot, copy most software. The quick buck made by those who sell copy cracking schemes hurts the industry and Apple Computer. Beyda would like to see some form of cartridge system for all game software. Then, the dollars now spent on protection could be applied to other areas, such as development, graphics and documentation.

Double Gold Software's 16-year-old president, Jeff Gold, believes that every computer owner has at least one pirated copy of software in his or her library. He agrees with Mr. Hunter that application software should not be protected. He feels that within a short time a protection scheme will appear that cannot be broken by any current, or future, hardware or software device.

Penguin Software's Mark Pelczarski also foresees a cartridge system for game software within a couple of years, and feels that companies that protect application software (Penguin was one of the first to drop protection in this category) are asking for piracy.

Many of the 'fest's visitors believe the media have magnified the piracy question. Some ventured that if the software companies were to lower their prices (to an average of perhaps $19.95), and offer a reasonably priced backup copy ($3 to $5), people wouldn't bother copying. Others stated that no matter how low the price went, copying software is a challenge to them. The greater the hype a copy protection scheme receives, the better they like to dig in their heels and try to bust the code. These folks were, however, definitely in the minority at this Applefest.

All in all, this fair was fun and informative. Participation seemed up, and the strong presence of Apple Computer itself was superb support for all in attendance. The trials and tribulations involving management and accommodations were a real problem. But, this aside, the San Francisco Applefest gets good marks. ■

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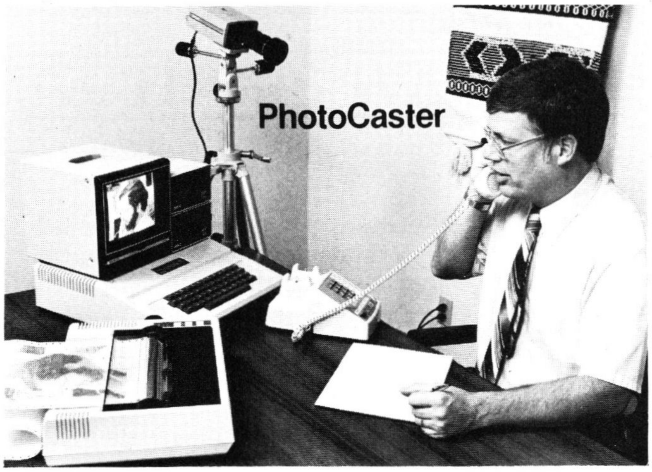

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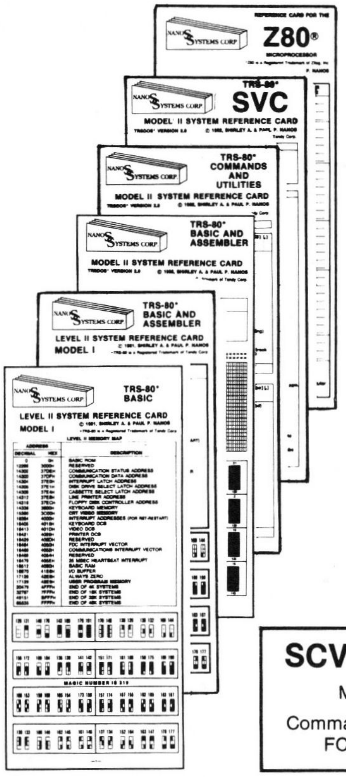

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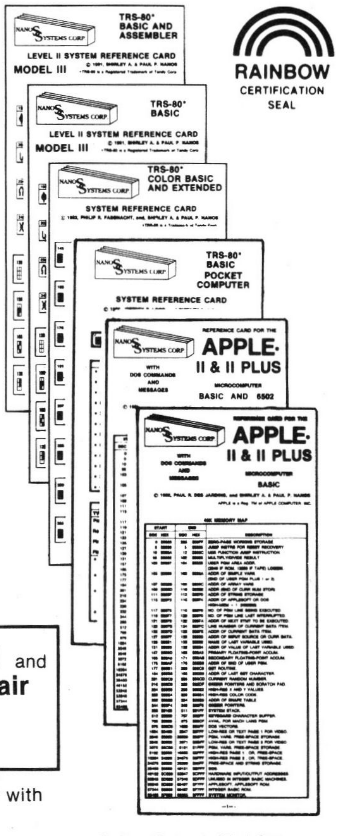

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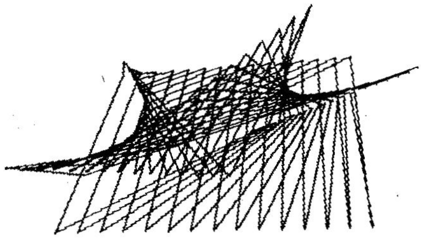
Graphic Goodies

by Lee E. Sumner

Stencils in String Session 1

inCider would like to make a habit of listing graphics programs that are more than ordinary in their presentation. Such is this month's offering. . . a delightful view of delicate simplicity.



This program, adapted from a demonstration program I witnessed on a Tektronix graphics computer, demonstrates the speed and ease of Apple graphics.

The program starts by clearing the screen. The color is set to white, and the number of corners in the figure to be drawn is selected. Two random figures, with the same number of corners, are stored in arrays. The distance between each corresponding corner is divided by 15, and then 15 progressions of the figure are drawn. This program bears a strong resemblance to string art, and will run forever until you press either control-C or reset. ■

Address correspondence to Lee E. Sumner, 75 E. King St., Dallastown, PA 17313.

```
10  REM   GRAPHICS DEMO
20  DIM X(8),Y(8),X1(8),Y1(8)
30  HOME
40  HCOLOR= 3
50  HGR : POKE  - 16302,0
60  REM    THE FIGURE HAS 3 TO 7 SIDES
70 N =  INT ( RND (1) * 5) + 3
80  REM  SET UP THE CORNERS
90  FOR I = 1 TO N
100 X(I) =  INT ( RND (1) * 279)
110 Y(I) =  INT ( RND (1) * 191)
120 X1(I) =  INT ( RND (1) * 279)
130 Y1(I) =  INT ( RND (1) * 191)
140  NEXT
150  REM  MAKE LAST CORNER SAME AS FIRST
160 X(N + 1) = X(1)
170 Y(N + 1) = Y(1)
180 X1(N + 1) = X1(1)
190 Y1(N + 1) = Y1(1)
200  FOR I = 1 TO N + 1
210  REM   15 FIGURES
220 X1(I) = X1(I) - X(I)
230 X1(I) = X1(I) / 15
240 Y1(I) = Y1(I) - Y(I)
250 Y1(I) = Y1(I) / 15
260  NEXT
270  REM  DRAW THE FIGURES
280  FOR J = 1 TO 15
290  REM  GO TO INITIAL POINT
300  HPLOT X(1),Y(1)
310  REM  DRAW REST OF FIGURE
320  FOR I = 1 TO N + 1
330  HPLOT  TO X(I),Y(I)
340  NEXT
350  REM  SET UP FOR NEXT FIGURE
360  FOR K = 1 TO N + 1
370 X(K) = X(K) + X1(K)
380 Y(K) = Y(K) + Y1(K)
390  NEXT
400  NEXT
410  REM  PAUSE TO ADMIRE WORK
420  FOR Z = 0 TO 3400: NEXT
430  REM  DO IT AGAIN
440  GOTO 50
```

Program listing.

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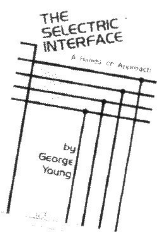

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IS02

Downgrade Your Apple

by David T. Shaffer

Auto-start or Monitor ROM? That was the question I faced two years ago when I bought my Apple II Plus. And what a question! I had done some programming in college, but I didn't know much about microcomputers. As I looked at the two machines, it seemed that the Auto-start ROM made the whole process easier: Just turn the machine on and everything is ready to go. When the resident language (Integer or Applesoft) comes up, the appropriate prompt character is displayed. If a disk controller card is plugged in, it automatically boots and DOS is loaded.

With the Monitor ROM, when you turn the machine on, you have to press control-B to bring up the resident language. Booting DOS requires PR#6 or, from the monitor, 6-control-P.

And if you hit reset—the Monitor ROM dumps you back into the monitor and you have to start all over again. The Auto-start ROM neatly brings you back to life in the resident language, or wherever the reset vector at $3F0 is set.

Why would anyone want the Monitor ROM? On the surface, Auto-start is easier, but the Monitor ROM had a few features that were lost when the Auto-start feature was added—a Mini-assembler and Step and Trace for machine-language programs, to name a few. But if you bought an Auto-start ROM machine, you couldn't take advantage of the features.

At least until now. Now the story becomes interesting. MPC (San Diego, CA) came out with a 32K RAM board—in and of itself, not all that exciting. The advertisement described the ability to add your own monitor to the RAM board. This sounded like just the way to add the Monitor ROM to my system.

My local Computerland did not handle the MPC board, so I called a California distributor and a week later I had my board. It's nicely built and plugs in with no problems. Like typical RAM cards, it must be inserted into slot 0 and strapped into the motherboard. Now all I had to do was get the Monitor ROM chip from Computerland. I led a long search through the dusty drawers of the service shop. Who ever heard of someone wanting to downgrade their machine to the old Monitor ROM? Finally they found one and were happy to sell it ($13.50 list).

After rushing home I plugged it into the empty socket on the RAM board and powered up. The screen promptly filled up with garbage! Something had to be wrong. No amount of plugging, switching or typing at the keyboard would make anything happen. It just did not work.

Now it's time to seriously look at what's on the RAM card and how it interacts with the INTBASIC or FPBASIC from the System Master. When the System Master is booted, it first loads a RAM Card Finder at $301 (CALL 769) and when it is run, it sets $300 (PEEK 768) depending on whether or not it finds a card. If it does, it opens the card for a RAM Write by addressing $C081 twice and it then Bloads INTBASIC or FPBASIC at $D000.

Taking a brief look at INTBASIC, we find that it is a binary program that is $3000 in length. Since it starts at $D000, it extends clear up to $FFFF, or the top of memory. But wait a minute, the monitor resides at $F800 to $FFFF. So both INTBASIC and FPBASIC contain a copy of the monitor. I had a chip that had the Monitor ROM routine on it. By plugging the Monitor ROM (power OFF!) into F8 on the motherboard and booting DOS, I had the Monitor ROM in the machine. I saved the Monitor routine as a binary file, "BSAVE MONITOR ROM,A$F800,L$800".

From this point on, I'll deal only with INTBASIC. The same applies to FPBASIC but I'm tired of typing them both.

The next step was to return the original ROM to the motherboard (power off). Turn on the power and boot DOS. A new disk needs to be initialized at this point with the Hello program from the System Master. Temporarily Bload INTBASIC,A$800 and then overlay the Monitor ROM at $3000 by "BLOAD MONITOR ROM,A$3000". Now Bsave the new INTBASIC by "BSAVE INTBASIC,A$800,L$3000" on the new disk. This is so the original INTBASIC on the System Master is left intact.

The INTBASIC on the new disk now has the Monitor ROM built into it. Boot your new disk and INTBASIC will automatically be loaded into the RAM card. Type INT and hit return; the Integer prompt > will appear. Hit reset and you will be dumped into the monitor. Type $F666 and the Mini-assembler prompt ! appears. The Step and Trace functions work as expected. Control-B puts you back in Integer. One problem—type FP and you get a ***SYNTAX ERR. Hit reset and you're back in the monitor. You're trapped! Applesoft is nowhere to be found.

Address correspondence to David T. Shaffer,
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> **''Wait a minute! It doesn't work that way.''**

All is not lost. The problem, if you want to call it that, is all in how the two monitors handle reset. For an excellent description, refer to pages 36–38 of the *Apple II Reference Manual.* To get back to Applesoft, hit reset, which brings you back to the monitor. Type $C082, press return, and the RAM card is deactivated and write-protected. The ROM on the motherboard is now active. Control-B will now bring you back to the resident language.

If you've been following to this point, and have actually built a new INTBASIC with the Monitor ROM in it, you may be saying, "Wait a minute! It doesn't work that way. I can toggle back and forth between Integer and Applesoft normally." That's true, until you hit reset. Once you hit reset, you're trapped in the Monitor ROM until you take the necessary steps to extricate yourself. Rather than field a lot of calls and letters, I'll explain how to do it.

If you're in the monitor, and you got there by hitting reset from the language loaded onto the RAM card, with the Monitor ROM overlaid on it, you will have to deactivate the RAM card as described above to get back to motherboard language. Otherwise, control-B will bring you back to the language you just came from.

The procedure is simple:

1. Copy the Monitor ROM to disk.
2. Load INTBASIC or FPBASIC at $800.
3. Overlay Monitor ROM at $3000.
4. Save the new INTBASIC or FPBASIC on a new disk with the System Master Hello program on it.
5. Run Hello on the new disk.

Downgrade your Apple? Now it's easy, and available when you want it. ■

Apple Editing Made Easy

by Dan Bishop

What's that you say? You own an Apple but are not a touch typist? You leave a trail of typos all over the place?

You *can* turn to your programming reference manual and try the edit procedures listed there, but more often than not, your edited line will contain more errors than the original. Furthermore, it is aggravating to have to press two keys (the escape key and either A, B, C, or D) to initiate a single cursor move. And what's worse, there is no logical relationship between the letter (A–D) or its position on the keyboard and the direction that key moves the cursor.

When I began serious programming on an Apple, I was dismayed to find it was, in most cases, easier to retype the offending line than to press this key, then that key, then another key and on and on to position the cursor and make a necessary correction. Until I learned some secrets for editing with the Apple, that is.

Simple Editing Tasks

Very short lines provide the simplest editing situations. Just retype the line, making corrections as you go along. Don't try to edit the line if you can type it in faster.

On longer more complicated lines, the edit procedure is still relatively easy if the line does not contain literals or string information. Look for a moment at the escape key on your keyboard. Think of it as an on/off switch to enable the J, I, K and M keys for cursor control. Press the escape key to initiate the cursor control mode. To resume normal keyboard entry press it again.

Before doing any actual editing, play around with J, I, K and M, using the escape key as a cursor control switch. Press escape. Now press the four letter keys at random and watch the cursor move. You may want to press one of the letter keys a single time, and then press the repeat key to move the cursor even further.

You will notice two differences in how J, I, K and M work in contrast to A, D, B and C. In the latter case, the escape key had to be pressed once each time the cursor was moved one space. Now you press the escape key only once, period.

The other useful feature of the J, I, K and M keys is that their respective locations on the keyboard are analogous to the directions the cursor will move. The I key moves the cursor UP, J to the LEFT, K to the RIGHT and M moves it DOWN.

Sample Procedures

Try editing a simple Basic line. For example, suppose that the following line has been entered into the program:

```
100 IMPUT X(I):PRINNT X(I)*100
```

Although it is not necessary, do a LIST 100 to display the line on the screen just above the cursor. Now press Escape to go to the cursor movement mode. Press I to move the cursor up to the line to be changed, and

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press J to move the cursor left until it just rests on the 1 of the line number. Then press escape again to return to normal keyboard mode.

Next use the right arrow to move the cursor to the right, copying into memory each character it passes. Use the repeat key if you have a long line of characters. Stop when the cursor is over the letter to be changed (the M in IMPUT), press the correct letter (N), then continue moving the cursor to the right until it rests on the next character to be corrected. Be sure, after making all corrections, to move the cursor to the end of the line of instructions (including wrap-arounds) before pressing return.

In the above example, the second error requires a deletion, not an overstrike. After you have copied over to the N that you want to remove from PRINNT, move the cursor to the right (in this case just one character) without copying. Probably you have guessed this can be done with the escape switch to turn on the cursor movement mode, pressing the K one time only, and then pressing the escape switch again to resume normal operations. Now you copy the rest of the Basic line into the computer's memory.

Inserting information into the line is not too difficult either. Suppose you wish to insert the instruction PRINT X(I) between the Input statement and the already existing Print statement. LIST 100, press escape, move the cursor over the 1 in the line number and press escape again to turn off the cursor movement mode. Then use the right arrow to move the cursor to the P of the Print statement, where you wish to insert your new material. The next step will look strange on the screen, but the input will be fine in memory. Move the cursor to a blank part of the screen, type in the material to be inserted, then return the cursor to the initial P and finish copying the line as before.

The cursor should now be over the P in the word PRINT. Press escape, use J, I, K and M to move the cursor to any blank part of the screen, then press escape again to turn off the cursor movement mode. Type in the PRINT X(I): to be inserted, press escape and move the cursor back to the original P. Press escape for normal keyboard mode, copy to the end of the Basic line and press return.

Although it takes a while to describe this procedure, with a little use you will find that program lines of moderate length can be edited more readily than retyped.

Also, using the overstrike technique it is possible to copy a Basic line of instructions into several different places in your program by simply overstriking the line numbers. When return is pressed, the old line remains in the program unaltered, while a new line (using your new line number) will appear with the identical instruction set. Of course, there is no reason why a line similar to one already existing in your program cannot be copied and edited into a new program line at the same time—a useful technique for copying complex lines within a program.

Complex Editing Tasks

Unfortunately, because of the screen editor that displays the program listings, not every job can be handled so simply. You may have noticed that lines longer than 40 characters are listed with blank spaces corresponding to left and right margins on the screen. This plays havoc with the editing procedures.

If these added spaces occur within quotation marks, *do not* copy them into memory. To avoid doing so, first copy to the end of a displayed line, being sure to pass over the last character you want to keep. The cursor will now be in the first blank space of the right display margin. To move the cursor from this position down to the next line and over to the first character on the next line to be copied, press escape, then K and repeat until the cursor is properly positioned to continue copying. Then press escape again to return to normal keyboard entry mode, and continue copying this line. You must always follow this procedure at a margin. Finally, when the entire Basic line has been copied into memory, press return.

The following example can be used to practice this technique.

```
100 PRINT"THE QUICK BROWN FOX
JUMPED OVER THE LAZY DOG THAT
WAS RESTING IN THE MID-OCTOBER
SUN DREAMING OF SNOW AND SKIING."
```

This line will be listed over several video lines—a real challenge to editing until you understand what is happening. Try to change the word "Resting" to "Sleeping," and to delete "Mid-October." The only way to verify the changes is by making sure this line is the only one in the program memory and then running the program to check the results.

Margin spaces not enclosed in quotation marks present no problem. The computer will ignore them anyway when the Basic line is stored. You can merely copy over them as if they didn't exist. Data lines, however, present much the same problem as quoted material, and must be treated in exactly the same way, quotation marks or not.

The most difficult problem is if a string of blank spaces is part of the literal information we want to copy, but the spaces come right at the end of the line and are indistinguishable from the margin spaces. The only thing to do here is to start counting! ■

The Applesoft Adviser

by Dan Bishop

Apple Variables II

The previous article in this series, The Applesoft Adviser, introduced the concept of variables and demonstrated how variables are used in Basic programs. Two advanced examples were presented in that article. The first provided a subroutine that allows a columnar display of decimal numbers to be presented with the decimal points lined up in tabular fashion. The second presented a subroutine that can be used for single keyboard entry response to displayed prompts and menu displays.

This article will explore the use of array variables. As before, the first portion will deal with the basic concepts and will include examples to illustrate these concepts. The second portion will outline a data entry routine that makes extensive use of array variables. Although this more advanced example will be explained thoroughly, the less experienced reader may wish to postpone a thorough study of it until he or she has had more background in Basic programming.

In The Applesoft Adviser last month, I suggested that a variable is similar to the tag we place on people or things that we call by name. When we need the quantity that a particular variable represents, all we do within the program is refer to the variable by calling its name. Thus PC%, for example, could be the variable name that represents the payroll count in a payroll program.

Frequently you need to refer to a number of related items within a program, processing each item in exactly the same way. Of course, each item could be given a totally different variable name. Thus you could have variables named AA, BB, CC, AC, RM, etc.

The problem with this approach is that the lines of Basic code that process this data would have to be repeated for each uniquely named variable. For example, suppose that at the end of a given routine you wanted to add 1 to four different variables. If these variables were named P1%, P2%, P3% and P4%, the following Basic lines in the program would carry out this function:

```
1000 P1% = P1% + 1
1010 P2% = P2% + 1
1020 P3% = P3% + 1
1030 P4% = P4% + 1
```

The number of repeated lines would increase dramatically as the number of treated variables increased. Also, more complicated processing, in which each variable would have to be dealt with by using more than just a single instruction line, would result in a longer program.

Arrays

Such repetition would be unnecessary if you could handle all these variables as a family, and specify each in a unique way that would not require each to have its own unique set of processing instructions. This is where array variables come in.

An array is a family of related variables, all having the same "last name." For example, to telephone any member of the Jones family, you would use the same procedure: look up "Jones" in the telephone book, select the appropriate name, lift the telephone receiver from the hook and dial the number shown in the book.

Each member of the Jones family is unique, and each has a different first name, but the procedure for calling any of them is the same. Similarly, all of the variables in an array have the same "last name," but each has a unique "first name." The first name in this case is (and must be) a numeric subscript.

Since subscripts are hard to represent on a computer display, they are

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conventionally shown after the variable name as numbers enclosed in parentheses. Thus A(1), A(2), A(3) and A(4) are four unique variables belonging to the A array. But since the first names (subscripts) are numeric, we can get the computer to change the numbers whenever we like, and thus call out whichever member of the array family we wish to work with at any given time.

To see how this can be done, let's redo the example above, in which four variables were incremented by 1. This time, select the variable names P%(1), P%(2), P%(3) and P%(4). The parentheses completely change the way the computer treats these variables. Before, they were four totally unrelated items. Now, they represent four members of an array family. To increment each of the four use the following code:

```
1000 M% = 1
1010 P%(M%) = P%(M%) + 1
1020 M% = M% + 1
1030 IF M% < 5 THEN GOTO 1010
```

This simplified example still requires four lines, but the same four lines could increment 25 variables as well as four, after changing the 5 in line 1030 to 26. Similarly, only one line, line 1010, actually increments the variables, while the first example needed four lines. The set of processing instructions needs to appear only once.

Also note that in the processing routine, the subscript is not a specific number, but rather an integer variable (M%) that takes on the appropriate values needed to refer to a unique variable. Thus the first time through this set of instructions, M% has the value of 1 and P% (1) is the variable being referenced. When line 1030 is reached, M% has the value of 2, so the program loops back to line 1010 and P% (2) is dealt with.

In the same way, we take care of P%(3) and P%(4). After P%(4) has been incremented, M% takes on the value of 5 and line 1030 allows the computer to proceed on past line 1030 and escape the loop.

The above example could have been simplified further using the For. . .Next loop structure as follows:

```
1000 FOR M = 1 to 4
1010 P%(M) = P%(M) + 1
1020 NEXT M
```

In this case we had to use a real variable name (M) for our loop counter—a limitation required by Applesoft Basic. But this is a subject for a later article.

Array Variable Names

The specific restrictions on naming array variables are identical to those limitations that apply to any variable. As I mentioned in Apple Variables I, certain reserved words used by Basic cannot be used for variable names or as part of a variable name. You'll be less likely to break this rule if variable names are just one or two characters (with the first character always alphabetic!), since only a few Basic reserved words have only two characters (IF, OR, FN, ON, AT, GR and TO).

Furthermore, although a variable name may be longer and more descriptive of the item it represents, Applesoft Basic only recognizes the first two characters as the variable name. Thus CHECK and CHOW would be interpreted by Basic as the same variable.

Array variables may be assigned to specific types, just as other variables. A percent sign (%) may be included after the variable name (but before the subscript) to specify that the elements within the array are to be treated as integers rather than real numbers (those with floating decimal points). A dollar sign ($) must appear between the variable name and the subscript for any array whose elements are strings. Thus A(12), RT(235) and ZA(4) all represent array elements that are real numbers, A%(12), RT%(235) and ZA%(4) represent array elements that are integers, and A$(12), RT$(235) and ZA$(4) represent array elements that are strings.

An interesting point is that all nine of the arrays presented in the previous paragraph could co-exist within the same program without conflict, since the computer keeps track of variable types as well as variable names. What's more, you could even have non-array variables named A, A%, A$, RT, RT%, RT$, ZA, ZA%, ZA$ within the same program that contains our nine arrays; the computer would treat all 18 variables as uniquely different items. This provides considerable flexibility in our choice of variable names.

The subscripts used with an array variable don't have to be integers, although the computer will interpret any subscript as an integer by truncating (cutting short) any numerals to the right of a decimal point.

As demonstrated in the above example, subscripts may themselves be variables. It is sometimes useful to use an array variable for a subscript. AA(P%(I)) is an example of this, where P%(I) is the subscript for AA.

Sometimes a mathematical expression may be needed to determine the value of a subscript. Then it is permissible to include the entire expression as the subscript. The computer will first evaluate the expression in order to determine the value for the subscript, and then continue. Thus RF$(I + 2*J + 1) is a valid array variable.

Computers get upset, however, if an array subscript is a string or is represented by a string variable. Negative subscripts cause an error message, although a subscript of 0 is acceptable. A BAD SUBSCRIPT prompt will be displayed if a subscript value exceeds the array specification made with the dimension statement (see below).

As you might expect, the same limitations on the actual values a variable represents also apply to array variables. An integer array variable may range in value from -32767 to +32767; a string array variable may range in size from a null string (" ") to a string with 255 characters in it; and a real numeric array variable may range in size from about 1 × 10 to the -38th power to about 1 × 10 to the +38th power, with numbers larger than 999 billion and smaller than 0.01 represented in exponential notation (such as 8.9322 E + 22).

Multidimensional Arrays

The simplest type of array is a sin-

L%(0)
L%(1)
L%(2)
L%(3)
L%(4)
L%(5)
L%(6)
L%(7)
L%(8)
L%(9)
L%(10)

Figure 1. A linear array, L%, having 11 elements.

Row	Column				
	1	2	3	4	5
1	V(1,1)				V(1,5)
2	V(2,1)				
3	V(3,1)	V(3,2)	V(3,3)	V(3,4)	V(3,5)
4	V(4,1)				
5	V(5,1)				
6	V(6,1)				
7	V(7,1)				
8	V(8,1)				V(8,5)

Figure 2. A two-dimensional array, V, having 48 elements. Only 40 elements are shown in this example, since the zero elements for each dimension are not being used. The choice of presenting the row subscripts first was arbitrary.

gle dimensional array, sometimes referred to as a linear array. Each element in such an array is represented by a variable name followed by a subscript composed of a single number. (See Figure 1.)

You can imagine all of the elements in such an array lined up one after the other in a linear sequence, with element 1 first, element 2 second, and so on. In fact, that is pretty much how the values for linear arrays are actually stored in memory.

Frequently it is advantageous to use array variables that have more than one dimension. A two dimensional array might well represent a table of values containing eight rows and five columns. (See Figure 2.)

Each element within this array is distinguished from other elements by a combination of two subscripts instead of just one. One subscript represents the row that the element belongs to, while the second subscript represents the column. Thus V(1,1) could represent the first value in our table, located in row 1 and column 1. The last value in the table would be V(8,5), located in the bottom right corner.

Now suppose you want to carry out a calculation that involves all of the elements in row 3. Just place the calculation within a loop that cycles from 1 to 5 (since there are five columns) and uses M% for a loop counter. Within the loop the variable name V(3,M%) appears in the calculation sequence. Each time through the loop, M% will have a different value representing the column number, but the row subscript never changes. It always has the value of 3.

Another example demonstrating the use of multidimensional arrays sometimes occurs in a database management program. Suppose such a program had six separate sets of data, or files, for each specific entry. Furthermore, suppose that, to keep track of the entries, each file required three pointers.

The best way to represent the pointers would be to use a two-dimensional array, P%(I,J), in which J could have values ranging from 0 to 5 to identify the specific file being dealt with, and I could have values ranging from 0 to 2 to specify the type of pointer used.

Now whenever the three pointers for a given file need to be manipulated (such as when a data set is deleted from the system), just identify the value J should have (for example, J = 3) and then do a GOSUB to the subroutine that manipulates P%(0,J), P%(1,J), and P%(2,J).

The number of allowed array dimensions may be greater than two, although you'll seldom encounter programs having arrays with more than three subscripts. The maximum limit set by Applesoft Basic is 88 subscripts, which, for practical purposes, is no limit at all.

It may be helpful to note that with multidimensional arrays, the specific elements are still stored in memory one right after the other in linear fashion. The order in which they are stored is based on cycling the leftmost subscript the fastest. Thus a three-dimensional array, with two elements in each dimension, would have the elements stored in the following sequence:

B(0,0,0); B(1,0,0); B(0,1,0); B(1,1,0); B(0,0,1); B(1,0,1); B(0,1,1); B(1,1,1)

The following short subroutine (using For. . . Next loops) shows how a two-dimensional string array, X$(J,I), could be initialized, setting all 15 elements to null.

```
10 FOR I = 0 TO 2
20 FOR J = 0 TO 4
30 X$(J,I) = " "
40 NEXT J
50 NEXT I
```

Note that the inner loop, using J as

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"...you must tell the computer to reserve space for the array, and how many members of the family will show up."

the loop counter, is also the leftmost subscript for the variable. This improves the efficiency of the program because the loop that cycles the fastest corresponds to the subscript that cycles fastest.

Making Reservations

One important feature about array variables sets them apart from non-array variables, and that is the matter of having to reserve storage space for any array you plan to use within your program. Suppose you plan to store 250 names in memory. You might wish to call this array NM$, so you would have elements ranging from NM$(0) to NM$(250). (This actually gives you 251 elements, but no matter for now.) Before the computer comes across the first reference to NM$ in your program, you must tell the computer to reserve space for the NM$ array, and how many members of the family will show up. This process is known as dimensioning the array.

Each array within your program should be dimensioned properly. You may dimension several arrays within the same dimensioning instruction, but you can dimension an array only once within a program. Attempts to redimension an array will crash your program. (Some Basics allow you to delete an array from memory and then redimension it. Applesoft Basic does not.)

Usually the programmer will dimension all arrays in one of the first lines of a program and have done with it. The instruction that dimensions arrays is the DIM statement, followed by each array name and its maximum dimension(s) in a list, with each entry separated from the others by a comma. Below are several examples of correct DIM statements.

```
DIM A(15)
DIM AR$(22), B%(12), FF(100)
DIM P%(12,3), A%(25,10,2), GM$(20,3)
```

The first example tells the computer to reserve 16 elements in a real array whose name is A. The second example dimensions three different arrays. The first is a string array, AR$, dimensioned for 23 elements. The second is an integer array, B%, dimensioned for 13 elements, while the third, FF, is a real array, dimensioned for 101 elements. (Remember that the number specified in the DIM statement is the maximum subscript allowed for that array within the program. If you dimension the array using the number N, you have N + 1 elements when you include the zero element.)

The third example also dimensions three arrays, and in this example all three arrays are multidimensional. The first array, P%, has two dimensions and reserves space for a total of 52 elements (13 × 4). The largest value allowed for the two subscripts is P%(12,3).

The second array dimensioned in this statement is also an integer array, but has three dimensions and specifies that memory be reserved for a total of 858 array elements (26 × 11 × 3). The third array to be dimensioned is a string array containing 84 elements (21 × 4).

Variables may define array dimensions in a DIM statement, but the variable *must* have a definite legal value assigned to it prior to its use in the DIM statement. For example, DIM A$(J), B(J,5) is a valid dimension statement if J has been assigned previously to a positive integer value before this statement is reached.

Although you can use a colon to separate several different Basic statements within a line, I prefer to assign the DIM statement a line entirely to itself and to dimension all the arrays I intend to use within a program in that single line. Some computer systems require that the DIM statement be in a line by itself. Applesoft Basic also permits several DIM statements, but a given variable may not be dimensioned more than once within a program.

Applesoft Basic allows one exception to the rule requiring that arrays be dimensioned. Small singly dimensioned arrays containing less than 11 elements (subscripts ranging from 0 to 10) may be used within a program without first being dimensioned. The computer will reserve space for eleven elements automatically the first time you reference one of the elements in such an array. However, for documentation purposes I suggest that you dimension even these small arrays at the beginning of the program.

I want to include a note regarding strings and the DIM statement as it applies to some computer systems other than the Apple II and Applesoft. Some systems require that each string used be specified within a DIM statement, with the maximum number of characters reserved for that single string given as the dimension for the string.

Thus DIM A$(12) would not reference a 13-element array, but would rather indicate that 12 bytes of storage be reserved for the non-array variable A$. Such use is uncommon with today's personal computer systems, but knowing this may help you sometime to convert an older program to work on your system.

Limitations on Array Dimensions

Array size is limited only by the size of available memory after your program has been loaded into RAM. Each array requires some memory overhead to store information about the array. For numeric variables, this overhead consumes two bytes to store the array name, two bytes to specify the size of the array, one byte for the number of dimensions used by the array, and two bytes for each dimension to store the maximum size of that

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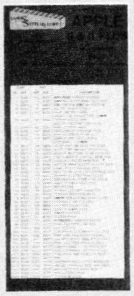

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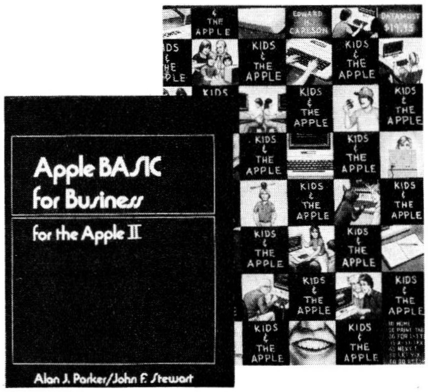

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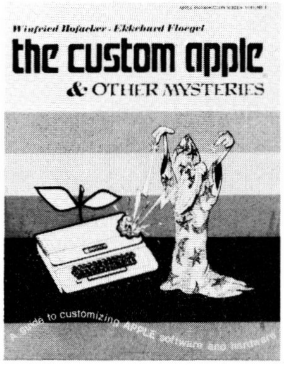

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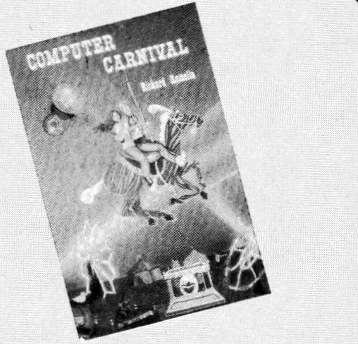

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particular dimension.

A singly dimensioned array thus requires seven bytes for overhead, a doubly dimensioned array requires nine bytes, etc. In addition, of course, each element requires space to store its particular value. This space comes to two bytes for each integer element and five bytes for each real numeric element.

String array variables have the same overhead requirements as numeric array variables, along with three extra bytes per element showing the length of that particular element (one byte) and the location of the string in the string storage area of memory (two bytes).

Of course, in the string storage area, each string occupies one byte of memory for each character in the string. Unlike numeric variables, which have their values stored in the same area of memory as the variable overhead information, the specific values for strings are stored together in a region of memory leading down from whatever value HIMEM is set to.

Specific locations for variable storage and memory locations may be obtained from the *Applesoft Basic Programming Reference Manual* (copyright 1981 by Apple Computer Inc.), pages 127 and 137.

Strings are allocated space in the string storage area dynamically. As the space for string storage begins to fill up, the computer will "hang" (stop program processing) for a short time while it searches the strings for old strings that have had their variable names reassigned. The computer discards these strings and packs the remaining strings together, thus releasing more string storage space.

This process is automatic, but the programmer can force it by using the instruction: X = FRE(0). Your program efficiency will improve somewhat if you insert this instruction several places in a complicated program that frequently reassigns string values.

Simplifying Data Entry Using Arrays

Data entry procedures, particularly in database management situations, usually require setting up a form to be filled in on the display, prompting the operator to enter information one item at a time, and then allowing the operator to correct any mistakes before storing the data to disk. Using array variables to represent the displayed prompts and the input data simplifies the process of displaying the data entry form and making any necessary corrections to the information entered.

The program listing illustrates how this can be done. Two arrays are used. The first, P$, contains the prompts for each of the six data entry items. The second, D$, contains the data input by the operator for each of the six items. This example does not use P$(0) and D$(0). Line 10 dimensions the two arrays.

Lines 20–25 use the Read. . . Data instruction within a For. . . Next loop to load the six elements of P$ with the appropriate display prompts. The data entry routine is a subroutine that you can call from the main part of the program when needed, using a GOSUB 1000 statement.

```
10   DIM P$(6),D$(6)
15   DATA  NAME,STREET,CITY,STATE,
      ZIP,SOC.SEC.NO.
20   FOR I = 1 TO 6
22   READ P$(I)
25   NEXT I
30   GOSUB 1000
1000  FOR I = 1 TO 6
1010 D$(I) = " "
1020  NEXT I
1030 K% = 1
1040  HOME
1050  FOR I = 1 TO K%
1060  IF I = 7 THEN  GOTO 1110
1070  PRINT I;". ";P$(I);": ";
1080  PRINT  TAB( 20);" ";
1090  IF I < K% THEN  PRINT D$(I)
     : GOTO 1110
1100  INPUT D$(I)
1110  NEXT I
1120  IF F% = 1 THEN  GOTO 1200
1130  IF K% = 6 THEN F% = 1
1140 K% = K% + 1
1150  GOTO 1040
1200  PRINT "= = = = = = = = = =
     = = = = = = = = = ="
1210  PRINT "ENTER THE NUMBER OF
     THE ITEM NEEDING"
1220  PRINT "CORRECTION, OR ZERO
     IF NO CORRECTIONS.";
1230  INPUT Z%
1235  IF Z% < 0 OR Z% > 6 THEN  GOTO
     1290
1240  IF Z% <  > 0 THEN  GOTO 127
     0
1250 F% = 0
1260  RETURN
1270  PRINT "OLD ITEM: ";D$(Z%);"
     NEW ITEM: ";
1280  INPUT D$(Z%)
1290 K% = 7
1300  GOTO 1040
```

Program listing. Using array variables to simplify data entry.

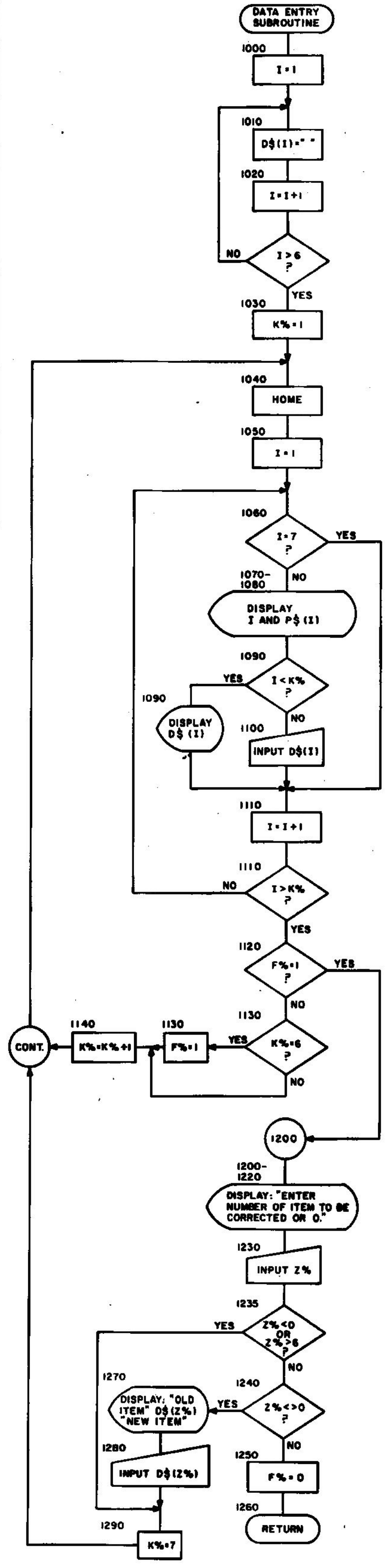


Figure 3. Flowchart depicting the data entry correction subroutine.

When the display form has been filled out and corrected, the operator enters a 0, and the processing sequence returns to the main program from line 1260. Figure 3 is a flowchart for the subroutine.

The first thing the subroutine does is clear any values that might have carried over in the D$ array. Then K%, the data entry counter, is initialized to a value of 1, the screen display is cleared, and the display loop (lines 1050 through 1110) is entered. In this particular subroutine, only the items leading up to and including the item currently being entered are displayed. Thus the first time the loop is encountered, K% has a value of 1, so only prompt P$(1) is displayed.

Furthermore, since I also equals 1, line 1090 is skipped and line 1100 is encountered, at which point the operator is prompted to input D$(1). At this point, lines 1120 and 1130 are also skipped, and the counter is incremented to 2 in line 1140.

The program cycles back to line 1040, clearing the screen and encountering the data entry loop again. This time K% = 2, so when I = 1 (the first time through the loop), line 1090 is executed and D$(1) is simply printed on the screen. The second time through the loop, line 1090 is skipped and D$(2) must be entered by the operator.

This cycle is repeated a total of six times. After the sixth time K% has a value of 6 and line 1130 is encountered that sets our "end" flag, F% = 1. K% is then incremented once more at line 1140, to a value of 7, and the loop is entered one last time. This time all six data entry items are displayed, exactly as entered, and the seventh time through the loop, when I = 7, line 1060 is encountered, forcing the program to bypass the data entry procedures and jump out of the loop.

This time, however, the "end" flag, F%, has been set, so line 1120 is encountered, forcing a jump to line 1200 and the portion of the subroutine that handles corrections. Lines 1210 and 1220 display the prompting instructions for the operator. If a zero is entered, then the flag is reset (F% = 0) and the computer returns to the main program.

If the operator enters another number (only 1–6 are allowed), then the earlier entry, D$(Z%), is displayed and a prompt is made for the corrected entry (INPUT D$(Z%)). At this point, K% is set to 7 and a jump is made back to the screen display routine which erases the old data entry form and redisplays the corrected form, returning once again to the item correction routine.

It should be clear at this point that using array variables greatly simplifies the task of programming rather complex procedures. The subroutine above does not require each of the six items to be handled uniquely, either at the data entry stage or at the correction stage. Furthermore, if additional items are to be added, then the only changes that need to be made to the above program are the actual numbers used that are based on the maximum limits of our arrays. These lines that need changing are lines 15, 20, 1000, 1060, 1130, 1235 and 1290. No additional lines need to be added.

The Input statement and tests in lines 1230–1240 could be replaced with a single-stroke keyboard response subroutine that was presented in The Applesoft Adviser. In this case, the following lines should be used:

```
1230 ZZ$ = "0123456"
1235 GOSUB 30
1238 Z% = Z% - 1
```

This assumes that lines 30 through 37 from the previous article's listing for "Menu Selection Made Easy" are included in the program.

Conclusion

This and the previous article might have been entitled "Everything You Ever Wanted To Know About Variables But Were Afraid to Ask." Having pretty thoroughly covered this subject, I intend to deal with the For. . . Next looping instructions and the Read. . . Data input statements in the next article in this series.

I encourage you to write to me with comments relating to these articles and future topics you would like to see covered. ■

SSD

The modern floppy disk is a wonderful piece of engineering. Aside from its obvious uses as a coaster and for leveling desks, it can also be used to store data.

Those of us who use large, cumbersome files in our work often are inconvenienced by one of the floppy's drawbacks—slow access time. How nice it would be if the information contained on the disk could be written and read as fast as information in main memory. While we're at the wishing well, wouldn't it also be fine to have another drive or two at our disposal, to jockey files and programs to and fro at our slightest whim. Synetix Inc., 15050 NE 95th St., Redmond, WA 98052, has introduced a product that solves all these problems with ease.

The SSD, or Solid State Disk, behaves in operation exactly as would an extra drive. Two versions of the SSD are available. One emulates one disk drive, the other, two. Various combinations of the boards, such as one dual and a single or two duals, may be used to act as three or four additional drives, respectively. All control circuitry is on the board itself.

Physically, the SSD is a hefty piece of electronics, reaching from the back plate of the Apple II to within an inch of the keyboard control board. Installation could not be simpler. The SSD plugs into slot 5 of the bus, taking power directly from the Apple's supply. No additional hookup is needed.

Apple DOS 3.3 works with SSD via the software included with the board. Optional driver software is available for Apple Pascal 1.1, as well as CP/M.

My Apple spends most of its time running under CP/M, usually doing word processing with WordStar. No small program, WordStar sometimes gets in my way on the disk, since it must be on line whenever it's used. The SSD seems to be just what the doctor ordered. After booting CP/M and the driver software, I load WordStar onto one of the Solid State Drives (drives C: and D:), leaving the real drives (A: and B:) open for whatever literary gems I may generate. The constant starting and stopping of the drive holding WordStar is gone, and two full (or should I say empty) disks are available for permanent data storage, in addition to the space on the SSD itself.

The documentation included with the board is complete and thorough, albeit occasionally difficult to follow. Sample assembly language source programs for interface to the board are offered for the more adventurous. Along with the driver software on the disks, Synetix includes source code for any who wish to customize the programs—a nice touch.

One of the utilities included allows you to format the dual version of the SSD as one 32 sector disk, rather than two 16 sector disks. Very large data files can then be manipulated more easily and more quickly than otherwise possible.

Does the SSD do the job? If the job involves the rapid access of large amounts of disk-based data, such as large database files, the answer is yes. I found the SSD behaved as promised, just as two more disk drives would, except *much* faster. The SSD is handy when making a large number of copies of a file or program. By putting the original onto the SSD, copy time is cut in half in most cases.

On the negative side, the SSD cannot be used for the permanent storage of data. Being a volatile memory, any loss of power to the board causes information on it to evaporate. You must not reboot by turning the main power to the computer on and off when the SSD contains needed data.

Certain self-booting and protected programs will not work with the SSD, nor will those that use oddball disk-access routines. However, there are few programs falling into this latter category. In most instances everything works fine.

The sheer size of the board can cause problems now and then. Being very front-heavy, it has a tendency to tip forward with time, possibly losing proper connection with some contacts in the bus. A welcome addition would have been a small plastic or rubber block to support the far end of the unit. A small square of cardboard seems to do the trick nicely for me.

At retail pricing the SSD is a good value when compared to the cost of adding two additional drives and a controller card to your Apple. Those items from Apple retail for $940, while the dual-drive SSD card can be had for $690. Three hundred ninety dollars will get you the single drive card.

All things considered, the SSD board is a welcome addition to my system, in terms of both versatility and speed. I can recommend this product to anyone wanting to improve the data handling functions of the Apple computer system. ■

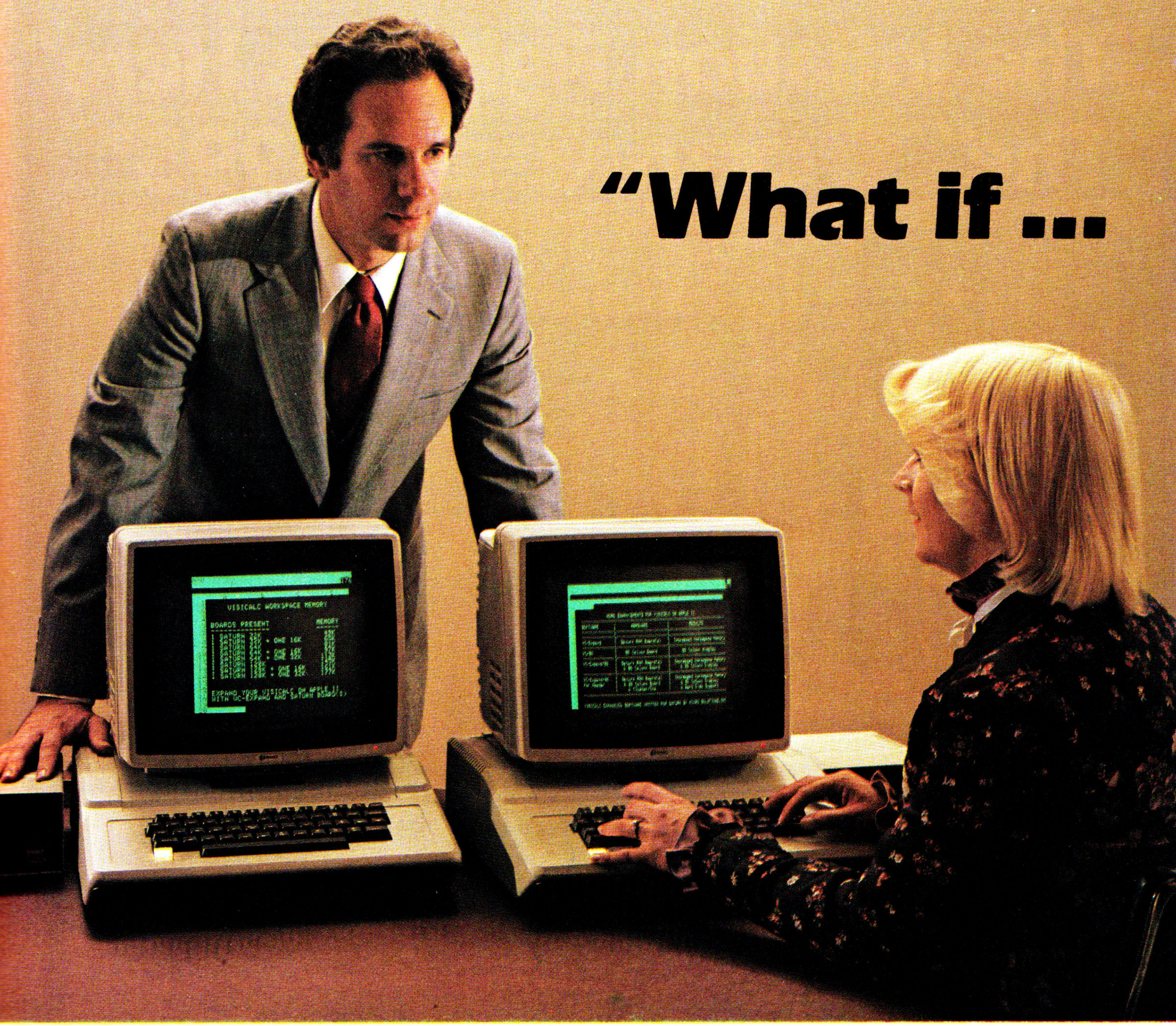
Chuck Doherty
South Dartmouth, MA

The Sensible Speller

According to the laws of nuclear physics, an action or reaction takes place when critical mass is reached. In the world of micros, the Apple II computer has achieved critical mass, with about 400,000 units sold worldwide. Apple software is abundant. Due to this broad base of potential buyers, and, of course, competition, the low cost of many excellent programs is maintained. In the field of serious software, word processors for the Apple are available with many sophisticated features not yet incorporated into office-type dedicated systems.

An example of the present state of Apple software is the appearance of several spelling checkers, a useful adjunct to the task of processing words. There are a minimum of five different software houses now offering software help for spelling errors and typographical mistakes.

The Sensible Speller (TSS) is the best friend a writer could have, and is the only program of its kind that works with Super-Text, including the latest 40/80 and 40/56/70 column versions. The price is a reasonable



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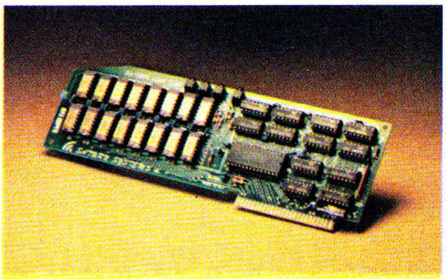

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$125. This includes a backup program disk, two dictionary disks (Main and Supplementary) and the *Random House Concise Dictionary* in hard cover. The latter is the basis for the program's vocabulary. TSS also checks spelling of text editors that use standard Apple 3.2 or 3.3 DOS, CP/M or Pascal files.

The program was ordered by phone on a Tuesday and arrived on Thursday by U.S. mail. TSS was easy to learn—I was correcting files of a book I am writing two hours after sitting down to learn the program. The program must be crash proof, as I never had to reboot.

This review is based primarily on my experience using TSS with Super-Text. I also used TSS experimentally with a few 3.3 Apple DOS binary and text files. No difference. The speller should work equally well with either CP/M or Pascal. A brief word about spelling checkers is in order before continuing.

Spelling checkers do not correct your mistakes—automatically or otherwise. They won't know when a word is used incorrectly but spelled correctly. A sentence, such as "I rode this peace with a pin," is accepted as having no spelling mistakes, even though the sentence would make more sense written as "I wrote this piece with a pen."

Spelling checkers compare words in your file against a list of words in the program dictionary. If the specific word is not included, it is presented to you for consideration.

What happens with Sensible Software's spelling checker is simply this: You compose your document in the usual way, then save the file to disk. After exiting the program, load the Sensible Speller, answer a few straightforward questions, and your opus will be processed for spelling and typographical errors.

You may want to correct more than one file before returning to the WP program. Once options for checking are set, TSS remembers your parameters, and, almost automatically, looks at the spelling. If you write a lot, word processors allowing large files are an advantage. Much time is consumed going from one file to another. Otherwise, TSS is as fast as advertised.

Checking Options

Every word in the selected file is checked against as many dictionaries as you wish. The main dictionary disk initially contains about 44,000 words. It is quite a feat of programming to fit that much data onto a single density five-inch Apple disk. Yet, space is left for about 11,000 additional words. Being able to add your own selection of words is absolutely essential for satisfactory operation. I suggest that you do not buy any spelling checker without this feature.

The supplementary dictionary disk contains the balance of words extracted from the Random House hard cover lexicon—words used less frequently. I employed TSS for over a month before writing this review, and I have added about 350 words, including names, to my copy of the main dictionary disk. I did not use the supplementary disk as I prefer to use only one dictionary disk. I constructed my own personalized collection of words.

While the program disk is copy protected, the disk containing the vocabulary is not. You are encouraged to duplicate it, as you must make a new copy every time you want to add (or delete) words. Since you'll expend considerable effort in constructing a personal vocabulary, you don't want to lose it by writing over the latest version of your disk. Backups are extremely important.

A minimum of three copies of the dictionary disk are highly recommended. This doesn't include the disks you receive with the package. Those are best write-protected, used only once to make the first copy, and then filed away for emergency use only.

In the process of checking your spelling, TSS gives you a count of the total and unique words in a file. I found this information useful. The ratio of unique to total words gives an indication of writing style. You can also have the number of occurrences of each word listed, to help you avoid using the same word too often.

Any word not in the dictionary is highlighted in context. You have four choices:

The default is to (I)gnore this occurrence. An example is a proper name, although frequently used names might as well be added to the dictionary.

(A)dd means just that. Adding names comes under what I would call a pet vocabulary. After using TSS for a while you should not find very many words to add.

The third choice is (L)ist. Any word in the dictionary can be listed using wild cards to find the correct spelling.

The last choice is (M)ark. Any word to be corrected is marked with a symbol of your choice for later correction. The main point in choosing a character for marking words is to pick one that is easily found with the word processor's global search and find feature, but does not occur in normal text.

In order not to bother with text formatting commands, there are two opportunities to tell TSS to ignore words that start with any symbol on the Apple keyboard. To give just a few examples:

When using Super-Text, you may want to ignore words starting with a control character. When using Aplewriter, you want to ignore words starting with an exclamation mark. ScreenWriter II and The Executive Secretary use a period followed by two or more letters. TSS will ignore these or any others once programmed to do so.

The same dictionary disk can be used for all versions of The Sensible Speller. This means that you can use the same vocabulary with more than one WP. Sensible Software will be releasing legal and medical versions in the near future.

As I mentioned, you can list words to the monitor or printer. I have one small criticism in this regard: When listing words from your file or the dictionary to the monitor, it is obviously necessary to determine the speed with which your words appear on the screen. This review con-

tains about 600 unique words. How much time would I want to spend viewing them? The TSS programmers selected the game paddle to determine reading speed, which gives a theoretical choice of 255 speeds. I dislike using paddles, and would prefer using the number keys to change speed, which, at the same time, could stop and start viewing.

Documentation consists of a table of contents, 47 pages of instructions and an index. All of Sensible Software's manuals are brief, but in this instance the documentation is more than adequate. The Sensible Speller is one of those rare programs which seems to have been designed by a potential user. The documentation is hardly needed. This spelling checker is logical, therefore friendly. If you use your Apple for word processing, you really should own TSS.

To use TSS you need an Apple with 48K of RAM, one or more disk drives and DOS 3.3. Two drives are highly recommended, since you cannot add or delete words with one drive. TSS is available from Sensible Software, 6619 Perham Drive, West Bloomfield, MI 48033. ■

Jerry Brieger
Redmond, WA

Teleport

Dimension disaster! You'll find everything from the curses of frustration to the smile of victory in Teleport from Cavalier Computer Corporation, PO Box 2032, Del Mar, CA 92014. And believe me when I say Teleport is not a game for the rank amateur. A combination of skills is required to max this arcade delight.

Your mission is to stem the tide of aliens teleporting into your dimension. These aliens look like renegades from a George Romero nightmare and wander about in aimless confusion, hostile to any physical contact with your defending guards.

But perhaps the tale is getting a wee bit ahead of itself. Teleport is written for Apple II with 48K bytes RAM and one disk drive. When you boot the game disk in the normal manner, the title page appears on the monitor, requesting your preference for keyboard or joystick mode. I started with a joystick, but later found the keyboard more responsive. Either way, you control a hi-res character whose job is to patrol a sector of your dimension. Using the keyboard, the left and right arrow keys control movement in the corresponding directions, and the A and Z keys move your guard up and down. Pressing the space bar, or the joystick button in that mode, makes him fire a stun ray at one of the motile aliens.

Control-C modulates the volume of the sound, while control-S turns the sound on and off. There's a control-V option for those who have Votrax connected to their Apple. The escape key is available to provide refreshing pauses every now and then. If you despise continuing a game you're losing, use control-R to restart at any point.

The aliens teleport with a great deal of graphic fanfare. Their shimmering presence can be detected far ahead of their actual arrival in your dimension, affording you time to position your guard for a stun.

Initially there are five aliens on the screen, compared to your three guards. Should you rid the dimension of one alien, lo and behold, it's replaced by another. The only method for their disposal is the stun rifle—and a guard must be directly in front of a wandering intruder to fire. If your aim is true, the alien stops moving and is encased in what appears to be a cocoon. This cocoon must then be dragged around the screen by the guard as he seeks the twirling infinity door, through which he must pass with alien in tow. Then Zowie! The alien disappears, and the scoring record at the base of the screen displays the new count of aliens teleported out of your dimension, your current score and the number of guards you have remaining.

Don't run into another alien. Firing the stun rifle again won't do any good. It has only enough power to stun one alien at a time. This means constant avoidance of the menacing meanies, whether you have an unconscious alien in tow or not. *Any* contact, and one less guard at your command.

Both stunned and transported aliens are worth 50 points. All told, a successful teleport of a stunned alien garners 100 points.

There are two other characters you should watch for as you defend your dimension. One is a Happy Star, easily identifiable by its five-point configuration and the smile broadly beaming on its face. Touch it and you get an additional 200 points. This personable fellow is a joy to behold and a pleasure to grab. Yet, there is another star, a Mean Star, you must avoid at all costs. Touch it and you're destroyed.

You may select any level of play you feel confident enough to tackle. This feature is especially attractive to experienced players who wish to test their expertise at Teleport without bothering with those lower-level scenarios I find so challenging.

Cavalier Computer has done a very good job, and hasn't followed the trend of charging over $30 for a piece of game software. The price of $29.95, which I still consider high, is, taking other software prices into account, within the range of reason for a single game. I recommend Teleport for your software game library. ■

Hartley Lesser
***inCider* staff**

Wordrace

Here's a program that brings a whole new dimension to the multiple guess quiz. Wordrace pits players against Webster, each other and the clock.

This diabolical vocabulary game incorporates a digital counter that registers 600 points at the beginning of each turn, and rapidly counts down to zero. The clock starts when you hit the return key. A word appears near the top of the screen, with

a choice of six definitions underneath. If you choose rapidly and correctly, you're rewarded with a high score. But alas, wrong answers result in loss of those hard-earned points—and the quicker your answer, the more points subtracted.

Worse yet, the program announces your mistake to everyone within earshot. There is no graceful escape from a word that stumps you. If you prefer quiet ignominy, you might want to disable the speaker on your Apple. The software does not offer this option.

Three vocabulary levels are available. The "beginner" game includes everyday words like deluge, elderly, campus and intelligible. This level would challenge most youngsters, and is playable by adults because of the time element. Remember, the highest score goes to the player who can read, comprehend and correctly respond quickest.

The "regular" game presents a considerably more difficult word selection. At this level, skill disparities between players are soon revealed. It's a great chance to show off to your friends, if that sort of thing impresses the crowd you move in. The database is large enough to keep the game going without a lot of duplication, though you could, I suppose, devote a large block of your time to memorizing all the words. That might help raise your score on the next standardized test you're obliged to take, but it also might alienate your remaining friends.

O.K., so you're H.L. Mencken, William F. Buckley and Theodore Bernstein all bound up in one superhuman approximation of the *American Heritage Dictionary*. You're ready for the Challenge Game. The vocabulary in this section is truly arcane. According to the pamphlet that accompanies Wordrace, "These words are all legitimate English words." But mortals shouldn't expect to recognize all or even most of them. The staffers here at inCider, most of whom are fairly comfortable with the English language, were generally reduced to random guessing. This part of the game really isn't fun.

Perhaps the publisher of Wordrace got the hint, because a supplementary disk, offering another level of play, is available separately. The "intermediate" vocabulary is somewhere between the first and second levels on the main disk. It's appropriate for a broad range of language skill, but is aimed specifically at teens.

The supplement also contains Claim to Fame, a test of your general historical knowledge, and Sports Derby, which tests sports recall. Both sections provide a good game.

Claim to Fame asks for the identities of a wide variety of historical figures; authors, scientists, generals and politicians share the screen. Some will be easy for any literate player, but others are suitably obscure. Playing a few rounds of Claim to Fame could boost your familiarity with a number of folks worth knowing about—an interesting selection populates the game.

Sports Derby nicely complements the other components of the two Wordrace packages. If you can identify James Naismith's contribution to the sports world, and you're equally familiar with the special talents of Frank Selvy and K. Abdul-Jabbar, you'll rack up the high score in this competition.

Wordrace is produced by Don't Ask Software, 2265 Westwood Blvd., B-150, Los Angeles, CA 90064. The master disk sells for $24.95. The supplementary disk, Accessory #1, costs $19.95. ■

Linda Stephenson
inCider staff

Serpentine

Serpentine, by Broderbund Software, is an arcade game with an unusual twist...snake-eat-snake. The object of the game is to rid a maze of hostile serpents and live to tell the tale.

You command blue snakes while your opponent, the computer, controls the orange ones. At the start of the game you have three of the slinky creatures, but you can control only one at a time. The computer, on the other hand, has the use of its whole trio. That's a ratio of three-to-one...not good!

You must either avoid or consume the opposing snakes. Big ones consume little ones when they meet head-on. If the snakes are of equal size, yours loses. The only advantage you have at this point is your reptiles' greater speed. Sneak-attacks are recommended—approaching an enemy snake from behind and gnawing on its tail. Once the enemy snake is shorter than yours, you can dare to meet it face-to-face.

A snake is constructed of segments, not more than seven in number. It can add a segment by consuming another snake's head, which requires a head-on assault.

Snakes lay eggs, losing a segment for each in the process. Eating enemy eggs is another way to grow. If an egg survives long enough, it hatches into a two-segment snakelet.

Frogs also live in the maze. They are rather tasty morsels, if you can catch them, and each is worth an additional segment. However, watch out, they eat snake eggs.

Once all of the enemy snakes are gone, the eggs yours have laid hatch—if you get back to home base before a frog eats them. The hatchlings move to the stable, and a new maze is constructed. Now you and your brood can start the whole process over again.

You score points when your snake eats a frog, an enemy egg or a tail segment. As you go up in point level, the value for tail segments increases as well. Consuming a serpent head bestows double point value. You receive extra serpents at various levels.

To control your scaly steed use a joystick or your own defined keys. I find the keyboard easiest, with the I, J, K and M key combination controlling the four directions. The escape key interrupts and resumes play—handy if you must stop to answer the phone or your spouse.

You can switch between keyboard and joystick during play, as well as change the horizontal and vertical axes of the latter if necessary. Sound may be on or off, and pressing return

displays the high scores. To save the high scores, I had to cut out the write protect notch on the game disk. You can enter your intitials beside your personal high score.

The entire package is excellent. I have loaded and played Serpentine using three different brands of disk drives. The instructions that accompany the software are clear, the sounds (trumpet fanfares, growling snakes, cracking eggs and frogs that 'ribbit') are interesting. Clear color and smooth animation add still further enjoyment to the game.

Not everything is perfect, however. If you use a monochrome monitor, you can't tell the difference between yours and an enemy snake. It is also difficult to detect when one snake is longer than another, unless the difference is extreme. When a color monitor is used, these complaints are no longer valid.

There are also a few problems with the game itself. Whenever my snake lays an egg on the far right of the maze, some kind of ghost frog eats it. Sometimes the computer cheats and sends a one-segment snake from its stable. Then the machine appropriates my snake and sends it over such a long route home that its unprotected egg gets eaten in the meantime—very aggravating. I also wish there were different skill levels available.

Serpentine is one of my favorite games, despite its occasional shortcomings. The action can be extremely fierce, especially at level seven and above. It's very hard not to enjoy Serpentine! ■

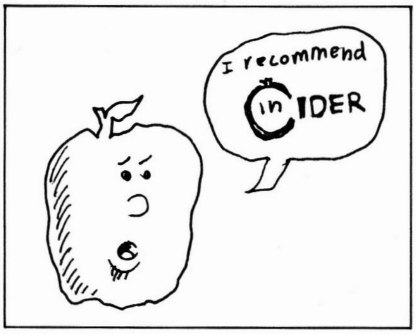
Lee Sumner
Dallastown, PA

Free Fall

Few human experiences are met with more ambivalence than falling.

Everybody loves falling in love, but a nighttime dream of falling is usually accompanied by fear and anxiety. Skydivers live for the moments of free-falling "flight," while lovers will have a falling-out and rush to their rooms in tears.

A sense of helplessness mingles with one of ecstasy when our feet leave the ground. The six-year-old knows of this paradox through leaps from the pool high board. It is an unbeatable combination to many, and an addiction for some.



Computer games, at their best, let you glimpse an unknown world—taste experiences you may never otherwise explore. You know they're not real, that the wrong step leading to a premature death also leads to the beginning of another game. Reincarnation is as close as the reset key.

The chance to play with forces, experiences and environments outside of your normal day-to-day world brings you back, repeatedly, to the glowing land of phosphor. Imagination gets free rein as you step off into the world of the unknown.

Upon entering the game of Free Fall you cling to an ascending beam that carries you to the ceiling of a chamber. Arms straining, you inch your way out into the room. You look down, see floating objects passing below and savor the safety you enjoy.

Then you let go! Ah—that marriage of helplessness and ecstasy. You've let go; there's no turning back. You know that riches and rewards lie below, but what a strange trip you face on the way down.

You glide past floating beams, tempting prizes and exploding bombs with no more that the slight lateral control of the skydiver. A crazily ricocheting ball adds just the right note of abandon to your journey. Whiz—it passes your left foot. Want a rest from your free-fall? Grab onto one of those beams. Let go when you're rested. You may even be carried back out of this strange world and get another free elevator ride to the ceiling. See a cherished prize? Maneuver close enough and it's yours.

But what would an environment like this be without danger? Occasionally a deadly needle rises like a bubble of poison gas, ready to rudely interrupt your sojourn with gravity. And that bouncing ball seems to have the fearsome habit of exploding the bombs it meets. Watch out for the spreading shrapnel!

You'd think that a successful descent through this bizarre world would be rewarded with a soft landing and great riches, but no, another challenge is waiting. You must fall in just the right spot—four holes to be exact, each closing as you pass through.

And there you'll find a reward! You pass to another room. Though similar in nature and skill requirements to the first, subtle differences add excitement as you eagerly make your leap again. This bip-bop world complements the first world of girders and precedes another world of gunners. Three falls through space, three falls in time.

Mark Turmell and Sirius Software have scored again with an innovative and exciting creation. Implemented for a 48K byte Apple II or II + with one disk drive, the program provides flexibility of use with either a 13 or 16 sector controller, and may be played with keyboard, Apple-compatible paddle, or Atari-type joystick connected to a Sirius Joyport.

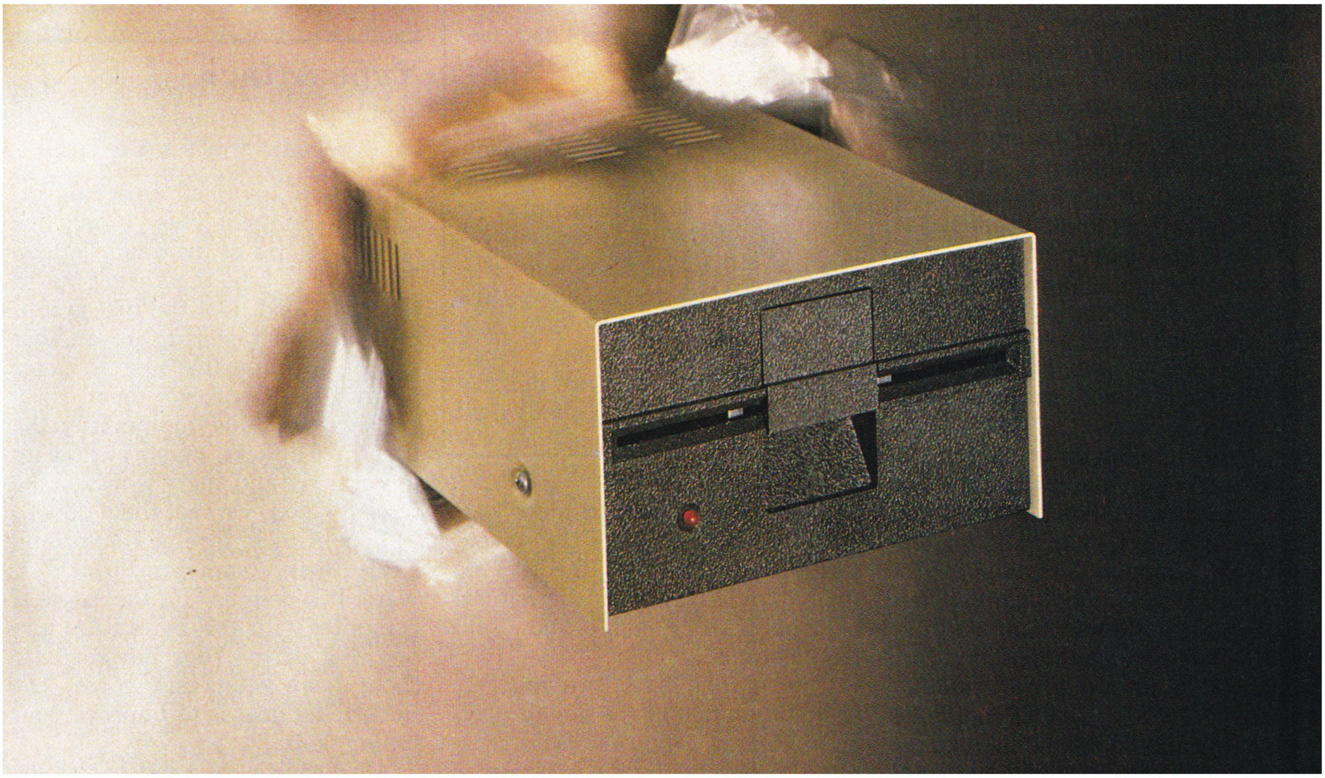
Convenience commands allow for pausing during the game as well as a "no-sound" option. The sound that is provided is lively and supportive of the action. Skill levels are available and advance automatically with each round of play.

So, drop into a strange new world, let go of your preconceived notions of reality, and fall for a new adventure with Free Fall. It's a release!

Free Fall is available from Sirius Software, 10364 Rockingham Drive, Sacramento, CA 95827. Price is $29.95. ■

David S. Bryan
Sausalito, CA

$299.



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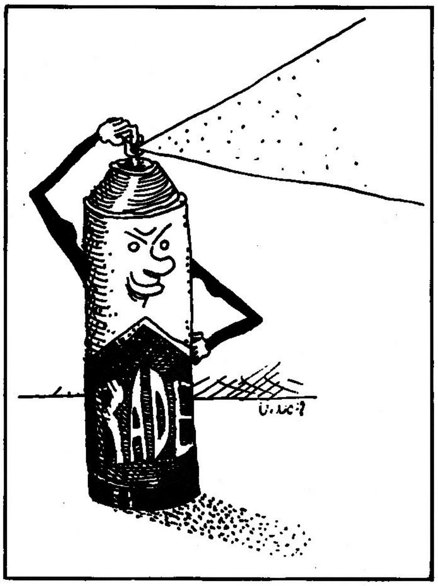
Bug Attack

How often have you cursed the aggressive ants that attack the prize cantaloupe in your garden? Or perhaps your mangoes have fallen prey to the medflies? Have miserable millipedes ever consumed your leafy lettuce and award-winning cauliflower? Well, put down that can of Black Flag. Hide your Raid, and throw out your Ortho Tomato Dust. Cavalier Computer has come to your rescue with their Bug Attack. Bet you thought you had no ally in that truck garden of yours, eh? You do. Author James L. Nitchals is a true friend, indeed.



What better way to destroy the crop invaders than with a non-corrosive, completely natural, pest purgative? Using paddle 0, or keypressing A and S on the keyboard for left and right movement, you manipulate a beetle against the marauding miseries. Your offensive weaponry consists of an unlimited supply of stingers fired by your emissary of destruction. These missiles are activated by pushing button 0, or the space bar if in keyboard mode.

By moving the beetle across the bottom of your monitor, you must avoid the constant barrage of knives thrown by the invading insects. This is no easy task, even for a battling beetle. At the same time, your berserk bug must fire at the opposing forces. And herein, my dear gardeners, lies the trick. The arrogant aggressors manage to move rather rapidly, and are also adept at hiding behind the plants in your garden. Green thumb or not, maintaining a pest-free garden is near impossible.

The horticultural hothouse planned by Cavalier calls for you to defend three types of gardens. First, a cactus garden, followed by a clover garden, and finally a flower garden. Ants lead the insect invasion initially. They are slow, but take their toll of your defender beetles. On completing this level, monstrous millipedes crawl over your screen . . . don't allow them to meet your beetle at the bottom of the screen! Lastly, the malignant medflies do their darndest to upset the natural balance of your edible and ornamental crops.

The garden gets progressively more difficult. For the novice player, screams of agony and head slamming become automatic responses as Bug Attack atomizes your confidence. Your three beetles soon disintegrate. Not a pleasant spectacle. Even experienced players are humbled by the game.

Each destroyed belligerent is worth 20–50 points. Should you destroy your own plants during a defensive barrage of stingers, you get one point for each succulent, clover, or pulverized blossom. However, plants that remain intact at the conclusion of a successful defense are worth five points each. Any leftover fuel is worth ten points per unused second. Speed can make the difference between a mediocre and a good score.

The escape key will halt the game. Any other keypress continues the action. Cavalier also performs marvelous music and sound effects for Bug Attack. A fine game. Guaranteed to drive one buggy from start to finish. Let's hope your copy will produce a Victory Garden.

Bug Attack is available from Cavalier Computer, PO Box 2032, Del Mar, CA 92014. ■

Hartley G. Lesser
***inCider* staff**

Type Attack

Invasion! Invasion! Attacking letters closing in! There is only one way to get rid of the angry letters. You have to type them right out of the sky. Good. Got the first group. Oh, no, radar picking up another group! This time they're even closer to my guns! Good, got them. Even got awarded three trophies from the first three attacks. Radar picking up lots of fierce and angry words on the screen! Good, we shot them down.

Type Attack, by Jim Hauser and Ernie Brock, comes from Sirius Software. It is designed for the Apple II computer with 48K bytes RAM and one disk drive. Your mission is to shoot down letters and words. The underlying goal is to improve your typing skills.

All during play a red bar at the left edge of the screen shows your typing speed. Lessons 1 to 39 progress rather like a typing manual.

The game consists of a Letter Attack, followed by a Word Attack. You first practice typing the letters by themselves in Letter Attack, and then in combinations in Word Attack. Whenever possible, commonly used words are shown.

After you boot the disk you will choose from the menu. The choices are: select a speed, start a lesson, create a lesson, start a new game, and play an old game that was saved.

Selecting the speed determines the speed at which the letters and words move on your screen, and also the bonus points you get. Beginners should select a speed from 1 to 19. If you're an intermediate player, you should select a speed from 20 to 50. Good typists should choose in the 60 to 79 range.

You can choose one of the lessons from 1 to 39. If you're a beginner, start with number 1. You can also

program lessons 40 to 99 yourself. Create a lesson by first entering the lesson number, such as 40. Then enter the letters to be used for the Letter Attack. The first two attack waves are the combinations you input, while the third attack wave is all scrambled up.

To create a Word Attack type in words (12 characters or less) on a line. If a word you're using is less than 12 letters, you have to use the spacebar to fill it out. The left arrow key moves the cursor back or down, the right arrow moves it up or forward. The return key is used to move the cursor over a column or row in Letter Attack, or to the next word or last word in Word Attack. Control-D saves your lesson to disk; control-V changes the direction of the arrow and return keys. The double-pointed arrow on the right side of the screen shows the current direction. Escape will end Create a Lesson and go to the menu without saving the lesson to disk. Start a New Game and Play an Old Game are self-explanatory.

A Letter Attack occurs in three different waves, each consisting of eight columns. The wave appears at the top of the screen and reaches to the bottom. Only the bottom character of each column is vulnerable to attack. If more than one character is the same, only the furthest left character will be blown out of the sky when you type it from the keyboard. Each time you type the character, it disintegrates. You do not have to aim.

Type up a column, starting with the one on the left. When you've almost destroyed every character in that column, the remaining columns will start falling toward the bottom of the screen faster. Again type out the letters that are closest to the bottom of the screen first. If any character touches the bottom, the attack is ended and you lose energy. However, wiping out an entire wave earns you a trophy.

In the Word Attack mode, groups of complete words fly across the screen. They go off the left edge of the screen and reappear on the other side. Only one can be destroyed at a time, and this target is indicated by a blinking shield below. You must type the whole word and press the spacebar or return key to wipe the word off the screen.

Letters entered on the keyboard are displayed below the vulnerable word and move it. To correct typing errors, use the left arrow key to move back one letter and the return key to erase all letters entered.

If you complete Word Attack, you will advance to the next lesson and a new set of letters. If you earn your three Letter Attack trophies and blast all the Word Attack words on their first pass, you can play Bonus Words. There are no penalties during this attack, only extra points.

Each lesson begins with 100 units of energy. During Letter Attack, a typing error uses one unit of energy. Each wave to hit the bottom of the screen consumes 35 units. During Word Attack each letter in the vulnerable word adds one energy unit if the word is destroyed, or subtracts the same number of units if the word wraps around the screen. No energy is lost in Bonus Words. The bar on the right of the screen shows how much energy is left. The game ends when there is no more energy.

In Letter Attack, you earn five points for each letter destroyed, and you lose five points for each typing error. In Word Attack and Bonus Words, you earn 20 points per letter in each word destroyed. At the end of each successfully completed lesson, you earn bonus points computed by multiplying your average words-per-minute for that lesson times the speed you choose to play. If your score is high enough, you are allowed to enter your initials in the Hall of Fame.

This game has outstanding sound effects, music and graphics. Best of all, it teaches good typing at the same time as being fun! It is available from Sirius Software, 10364 Rockingham Drive, Sacramento, CA 95827 for $39.95. ■

Kirk H. Lesser
Hancock, NH

Crush, Crumble and Chomp

Have you ever wondered how Godzilla or Mothra perceived its relationships with mankind as it tried to obliterate Tokyo, or why The Blob chased and consumed Steve McQueen's friends?

On-the-job training in Automated Simulations's Movie Monster Game, “Crush, Crumble and Chomp!, can answer these and other bewildering questions. More than an adventure, this incursion into monsterdom reveals how the bigger half may have lived on the Silver Screen. This may be a classic in Apple computer gaming.

Slick packaging attracts attention. The game comes boxed, with a *Tyrannosaurus rex* about to consume a mail truck depicted on the cover. This much maligned creature towers above a fleeing populace, with three surrounding buildings facing imminent destruction by the king of the dinosaurs. (They happen to be none other than the IRS, AT&T, and Postal Service buildings—keep your cheers down to a dull roar!)

This review is based on the Apple disk version, which requires an Apple II or Apple II Plus, 48K bytes, one disk drive and a 13-sector controller. There are also versions for the TRS-80 Models I and III, and for the Atari as well. Both the Apple and TRS-80 versions are contained on a single disk, on different sides. A thick instructional booklet should be read immediately, and the six statistical cards put aside until needed. Loading instructions for both systems are found on a separate sheet inside the box.

The Manual of Monsterhood, though imposing, is one of the most entertaining game tutorials ever written. Humorous and thorough explanations quickly guide you through the material. You'll soon realize that, through the courtesy of Automated Simulations, you can wreak havoc on one of four population centers: New York City, the

Jump	8
Fly	40
Breathe Fire	40
Immolate	5
Stomp	10
Obliterate	N/A
Atomize	30
Descend	20
Paralyze	10
Ultra Scream	30
Tail Lash	5
Head Tilt/Turn	STD
Crumble	15
Grab	10
Eat	N/A
ZAP	15
Web	N/A
Regeneration (Healing)	
Very Slow	20
Slow	50
Fast	100
Very Fast	N/A
Strength	
Increase	15
Normal	0
Decrease	– 15
(this is added to your CCs)	
Hide	
Soft (no hide)	0
Thin	1
Medium	2
Tough	5
Hard	20
Armor	35
Swimming	20
Contamination Trail	30
Fiery Trail	50

Table 1.

San Francisco-Oakland Bay area, Washington DC or Tokyo. Helpful maps of each city, though altered to fit the game, are included to aid the player in keeping track of monster location and intended targets during game play.

Upon loading, versions for some computers will ask if the player wishes sound to accompany play. The Apple version may only be played with sound intact. Disk versions will then ask if the player wishes to continue a previously saved game. Then, speed of play is chosen. This governs the amount of time the player is allotted to make those fateful decisions that affect the monster's actions. Computer-controlled activities also fall within this player-determined game speed, such as the arrival and movement of panic-stricken mobs, National Guard units and helicopter assaults. A novice player would be wise to choose the slowest mode of play possible.

Participants with disk versions play the game in one of two ways: They can control a Feature Creature, one already programmed with certain abilities, or grow their own beastie from scratch. This latter option is one of the best features of the game.

Cassette users need not be disheartened, however, for the predetermined colussi are, in themselves, awesome and playable. In fact, all players should start with one of the predetermined monsters and learn the game through a scenario, as suggested by the tutorial author.

To involve a Feature Creature, the user enters an F. The screen clears to display the following choices:

1) GOSHILLA
2) KRAKEN
3) ARACHNIS
4) THE GLOB
5) MECHISMO
6) MANTRA

The player enters a number corresponding to his or her choice. One of the six statistical cards details all of the necessary commands for the selected monster.

The Manual of Monsterhood presents four scenarios to assist the player in learning the game. Exciting play is captured in "It Came From Beneath Its Budget" (where San Francisco Bay becomes the playground of a Kraken, bent upon total destruction), "Goshilla vs. the Smog Monster" (with Tokyo the target, where Goshilla battles not only the humans, but the smog as well), H.G. Wells' classic "War of the Worlds" (in which Washington DC takes on Mechismo, a combat machine that would turn C3PO rusty with envy), and lastly, "Breakfast at Tiffany's" (which reveals the good nature of a giant spider).

Each of the scenarios is great. Roughly 120 play combinations exist for cassette players, and over 160 are possible for those with disk capabilities. That should hold your interest.

All commands for your creature consist of single key entries, including M(ove), J(ump), S(tomp), F(ly), B(reathe Fire), H(ead), I(mmolate), D(escend), G(rab), E(at), C(rumble), O(bliterate), T(ail or Tentacles), W(eb), P(aralyze), U(ltrasonic Scream), A(tomize), Z(ap), and even N(othing), which is handy while awaiting the arrival of a meal.

The Feature Creatures have the powers as identified on their statistical cards. Other gifts some possess are:

● Fiery Trail—no matter where your creature walks, it leaves behind a trail of fire., This causes the ignition, depending upon wind direction, of units and/or buildings. Best of all, this blazing barrier also stymies pursuit.

● Radioactive Contamination—a trail of radioactive waste is left in the monster's wake, which is impossible for units to pass through.

● Swim—self-explanatory.

For those with disk drives, the ability to create a monster starts with your being informed of the number of Crunch Credits available to a specific body type:

1) BIPED
2) SEA MONSTER
3) INSECT
4) AMORPHOUS
5) ROBOT
6) FLYER
7) BRONTOSAUR
8) SERPENT

The Manual of Monsterhood indicates how many Crunch Credits each specific "talent" will cost in the development of the specific type. For example, a robot, which cannot get hungry, would begin with 120 credits. The cost of each special quality or ability is listed in Table 1.

For your creature to obtain all of these occupational specialties would cost you more CCs than can be drawn upon. The player must make a decision on desirable characteristics for the creation. My own robot, Ghastblud, delighted in having Fiery Trail, hard hide, slow healing, Zap, Immolate, Grab, and normal strength. He did quite well.

In addition to moulding your creation, you must also decide upon an objective for the beastie. There are

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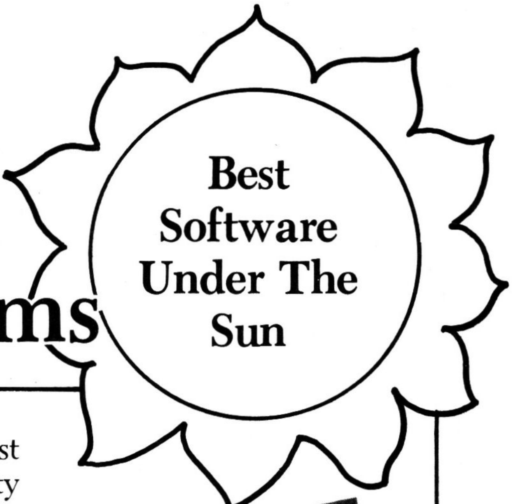

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- Killer Monster—with human units as your number one target.
- Combat Machine—where battle against human units scores the most points.
- Destruction—where edifices and bridges are your targets.
- Survival—wherein evasion and escape earn you the most points.

The varieties are endless. One could elect to own a flying robot, a swimming blob, or perhaps a fire-breathing spider. The final selection involves choosing the relative strength or weakness of his or her creation.

After entering all of this required information, the screen announces, in marquee fashion, that the player has a starring role in the feature movie about to be shown. Co-starring are the National Guard units, tanks, artillery, police and panic-stricken mobs. Examples of terrain features are also presented.

The adventure starting areas for either land- or sea-based creatures are drawn on the screen. Nine important areas for the operation of your beastie are also displayed on the right side of your monitor. This lists in detail the current wind direction for each turn—invaluable information to those fire-breathers who stalk the screen.

Also revealed are your monster's health (which ranges from healthy to critical), the direction in which your beastie is headed, whether the thing is hungry or not, whether there is a tasty morsel in one's paw, the head tilt and angle, and last, whether the monster is awaiting a command from its trainer.

The Manual of Monsterhood will be a constant reference source; it contains some little pieces of advice no monster maker should be without. The authors have done a superb job with Crush, Crumble and Chomp. The game is recommended, due to its countless possible scenarios, enjoyability factors, and the thrill of finally seeing your favorite city demolished beneath your feet. A fun game for all those 50s matinee goers who remember the thrill of watching a young Raymond Burr flee the onslaught of the first Godzilla! Now, the shoe is on the other foot.

The package is available from Automated Simulations, 1988 Leghorn St., Mountain View, CA, for $29.95. ■

Hartley G. Lesser
***inCider* staff**

Seafox

Seafox, recently released by Broderbund Software, leaves me with mixed feelings. On the one hand it has that special quality that makes a good game: When you finish playing, you want to play it again. On the other hand there are several things I don't like about it, and I'll explain those later.

Seafox is a standard submarine chase game in which you are given various missions to accomplish. Each mission consists of destroying a row of merchant ships moving across the top of the screen. Five levels of play, each more difficult than the one before, challenge the player.

Life is made difficult for you in several ways. First of all, you must avoid other submarines patrolling the waters. In the earlier missions you only have to avoid contact with them. Starting with your third mission they fire torpedoes, which you have to dodge.

You have two ways to destroy your enemy. You can fire torpedoes head on (right to left on the screen) at other submarines, or up towards submarines or ships on the surface. Certain obstacles prevent you from just firing at them any time you wish. Hospital ships float along underneath the merchant ships that are your main targets. This makes it hard to hit the merchant ships every time. If you accidentally shoot a hospital ship, your torpedo will be deflected down into the water until it collides with some object or the ocean bottom. You can't fire up again until your torpedo explodes or hits bottom.

Two things to watch out for are fuel and torpedoes remaining. Fortunately, a supply sub comes along the ocean bottom occasionally and releases a trained dolphin carrying fuel and torpedoes. You must intercept the supply pack before a giant clam comes along and gets it. Don't hurt the dolphin—the results will be fatal.

Starting with the second mission, destroyers join the hospital ships above the water and start dropping depth charges. This makes things a bit more hazardous, but the depth charges destroy anything they hit—including enemy submarines.

By implementing what you have learned up to this point, you might be able to survive the magnetic mines that replace the enemy torpedoes on the fourth mission. I have not made it past this level, but I assume that you have to survive both mines and torpedoes on the fifth mission.

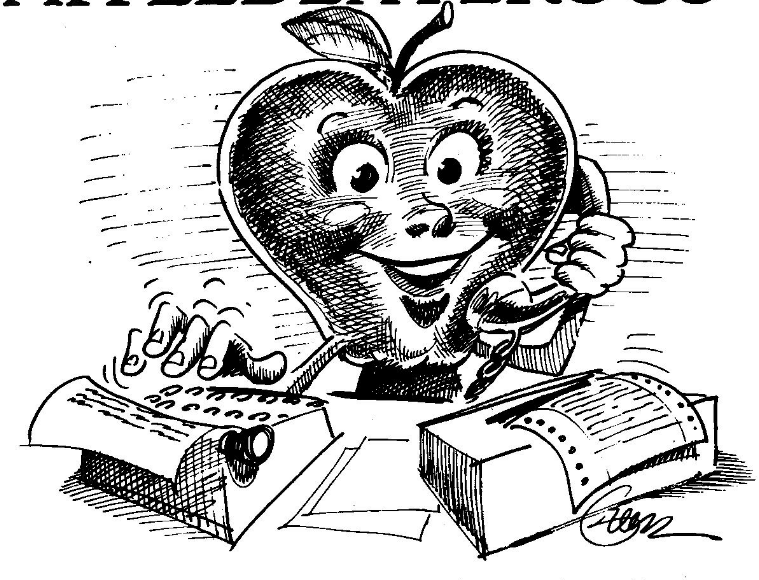
The demo mode indicates that magnetic mines will be introduced in either the fourth or fifth mission.

All things considered, this is a good game but, as I said earlier, it has some weak spots. By the third mission the animation slows down quite a bit; it's adequate, but the delay detracts from the game.

The packaging claims that you can use keyboard, joystick or paddle control. I find a joystick the only acceptable controller. I don't like to use the keyboard in a fast-action game that requires you to manipulate 11 keys. The alternative of using the two paddles to control the horizontal and vertical movements simultaneously is cumbersome for most people, especially young people with small hands.

Seafox is written in machine language and runs on an Apple II with 48K RAM, II Plus and a 13 or 16 sector controller. It comes, for $29.95, from Broderbund Software, 1938 Fourth St., San Rafael, CA 94901. ■

Jim Eatherly
Washington, DC



Bent on Business

by Gregory R. Glau

Graphs Make the Point

Information. In business—any business—it's the name of the game. What information you have, and what use you make of it, is relative to your own business, of course. But no one can operate today without effective use of information generated by the actual performance of the business.

What's selling? What's not? Who's working efficiently? Who's not? Is our advertising effective? Are we spending too much on auto costs? Insurance? Accounting? And, the bottom line of all this: Where are all our dollars going?

Lately, more and more use is being made of business graphics, where you're given a "picture" of financial information, rather than just the numerical data itself.

These business snapshots are rapidly filtering down to microcomputer users; today, anyone with an Apple II and a graphics printer can buy a software package or two and create informative, helpful business pictures. And, after all, many things are simply more effective when you *see* the relationship between them. Rows and columns of numbers are necessary, but often don't tell you a lot.

For instance, when someone reports that sales for the first six months of 1981 were $169,000, and for the same period in 1982 they ran $142,000, you can understand and assimilate that information. However, if someone gives you a list like the one in Table 1, you'll have a hard time really understanding it.

I suspect that you'd do the same thing I would with this list—sit down and add up the columns. And if they were already totaled, they'd still give little more information than the original statement about last year's sales.

So the logical thing is to create a graph of the data. While many businessmen don't have the time to sit down with pencil, ruler and graph paper to chart their own business information, with their Apple they can do it easily and quickly.

In a future column, we'll examine what graphics packages are available, how easy they are to use, and how to get hard copies of your business pictures. But today I want to suggest a couple of uses for your own business graphics—one to do with sales, and the other to do with costs.

Graphing Your Data

Remember, in graphing business data you're looking for the visual relationship between the numbers; you want to see how the figures relate to one another. This means you don't have to be able to look at a point plotted on a graph and say, "Ah, sales for March were $27,823." If you scaled a graph so you could read the exact figure, it'd be too large to tell you anything. You can always go to the printed list to get the precise dollar figure if you need it.

The point is, of course, that you're looking at a picture of the data, rather than the numbers, and this snapshot will help you better understand the information.

Case in point: We operate a heating and air conditioning business, and one large monthly expense is gasoline for our service trucks. The figures for 1981's gas costs, and for the first eight months of 1982, appear in Table 2.

Now, while all these numbers are nice and correct, and while you can see that 1982's gasoline costs are generally lower than 1981's, isn't a graph of that same information (Figure 1) more effective?

A Red Flag

Using this simple line graph, you can get a pretty good idea of the ac-

	Sales 1981	Sales 1982
Jan	25,037	18,921
Feb	35,500	26,455
Mar	27,823	15,770
Apr	37,287	30,579
May	30,428	24,304
Jun	40,498	26,389

Table 1. Sample business data.

	1981	1982
Jan	798	884
Feb	824	509
Mar	754	437
Apr	949	438
May	997	314
Jun	998	453
Jul	983	532
Aug	1022	657
Sep	999	—
Oct	939	—
Nov	892	—
Dec	859	—

Table 2. Gasoline costs in the author's business.

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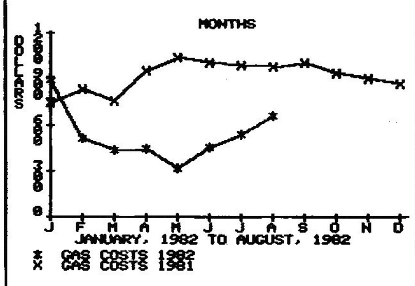

Figure 1. Graph of data in Table 2.

tual monthly costs, see how one year relates to the other, and also note any trend in the data. I stopped the data with August 1982, so you could see what we discovered when we charted this graph for our business. While the costs were still way under 1981's gas expenses, the trend, running from May through August, was *up*—a disturbing factor. This reversed an earlier trend, where our cost-cutting program was *decreasing* gasoline costs.

Once you see a trend line like this one, you have the opportunity to correct the problem before it balloons into a major difficulty and puts a big dent in your cash position. What made gasoline costs rise? Were the service people taking the trucks home at night when they weren't supposed to? Were major truck repairs made during this period?

A graph like this gets you to thinking about what's happening in your business, and if there are some problems—which there definitely had to be with these gasoline costs—it gives you a chance to correct them.

The first thing I heard when I put out a copy of this graph for the employees to see was, "Well, our sales must have been really up, too, and that's why we used more gasoline."

Valid suggestion. Unfortunately, the program I used to create Figure 1 can't handle two different scales on the same graph. For instance, it won't let you put one graph line in increments of 10,000 (which we would need for sales), and another line in increments of 100 (which would handle the gasoline costs).

So, the next graph isn't quite as nice; it's my own, and doesn't have all the months and amounts listed (I'm not a fancy programmer). But this plain-Jane graph illustrates that you don't need all the names and numbers to understand what the graph says.

Look at Figure 2. The hash marks running across the bottom indicate months, starting with January, then February, and so on, ending with August.

The hash marks running up and down the sides of the graph actually represent two scales. For the solid line, each mark represents $10,000 in sales. On the graph itself, the solid line is for sales. Since each hash mark indicates $10,000 in sales, the first plot of the solid line indicates we sold about $20,000 worth of furnaces and such during January.

For the dotted line, each hash mark indicates $100 in gasoline costs. The first plot on the dotted line is for January, and indicates January's gas costs were about $900.

Remember, the vital thing is the visual relationship between the numbers. So omitting the month names and the scale up and down the sides of the graph shouldn't hurt you in getting this graph's particular message—that for the June through August period, gas costs were rising much faster than sales.

In contrast to that, early in the year, as sales declined, so did gasoline expenses. They went down during the February–March period; so did sales. They decreased in the April–May period; so did sales. Then, sales and gas costs both started rising—but gasoline costs went up much faster.

And that's the beauty of a graph: you can *see* that one line is increasing faster than the other. This meant we were spending more money per sale for gasoline than we had been, and this, coupled with the reversal of the early-year decline in gas costs, indicated we had a problem.

Simplify the Stats

Now that we've compared gas costs from 1981 to gas costs for 1982,

Figure 2. Plain-Jane graph of sales and gasoline costs.

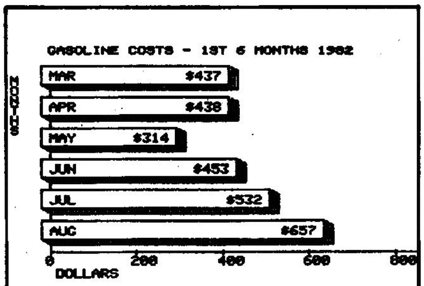

Figure 3. Bar graph shows all too clearly how costs have increased.

and done a gasoline cost versus sales comparison, what about just the gas figure itself?

Usually, the best way to show a single item is to use a bar graph; this makes the numbers easy to see and comprehend. Figure 3 shows a bar graph, but this one starts in March 1982, and runs through August 1982—to demonstrate how costs were increasing.

It's obvious to anyone looking at Figure 3 that gasoline costs over the past few months went up. While it doesn't indicate how they're doing compared to another year's costs (as Figure 1 does), and doesn't display their relationship to another current dollar figure (as Figure 2 shows), it clearly demonstrates where the gasoline costs are moving.

The second thing I want to examine this month also uses my "plain-Jane" graph, because I want to look at two things with widely different scales. I want to chart sales, which has monthly increments of $10,000, along with advertising, which has an increment scale of $100.

As you're looking at Figure 4, re-

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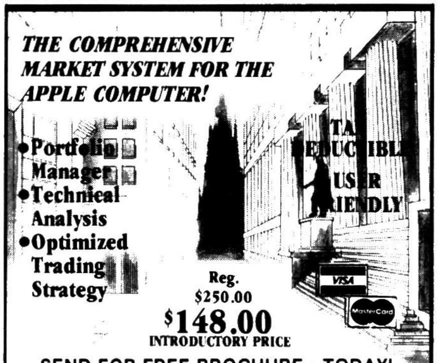

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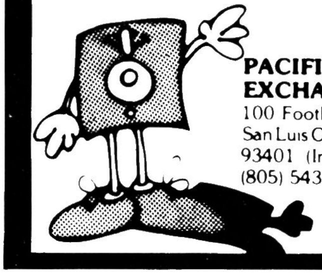

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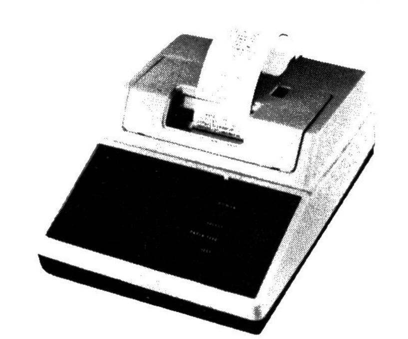

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        ADDR   DATA   INT  EXT    MNEMONIC
001     1000   4C0040 1111 0000   JMP $4000
002     4000   BD0C50 1111 0000   LDA $500C,X
003     4003   D003   1111 0000   BNE $4008
004     4005   4C1D63 1111 0000   JMP $631D
005     631D   A50F   1111 0000   LDA $0F
006     631F   0A     1111 0000   ASL
007     6320   AA     1111 0000   TAX
008     6321   BC1861 1111 0000   LDY $6118,X
009     6324   B90004 1111 0000   LDA $0400,Y
010     6327   29F0   1111 0000   AND #$F0
011     6329   851E   1111 0000   STA $1E
012     632B   BD1961 1111 0000   LDA $6119,X
013     632E   290C   1111 0000   AND #$0C
014     6330   AA     1111 0000`  TAX
015     6331   BD0061 1111 0000   LDA $6100,X
016     6334   C51E   1111 0000   CMP $1E
017     6336   F004   1111 0000   BEQ $633C
018     6338   E8     1111 0000   INX
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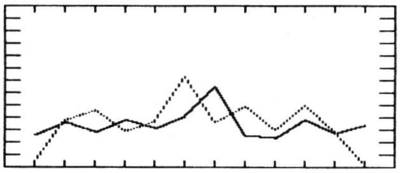

Figure 4. Sales and advertising costs. Both sets of data are plotted on the same line, a method that fails to reveal a correlation.

member that each little hash mark up and down the sides of the graph indicates $10,000 for the solid line (sales), and $100 for the dotted line (advertising).

Again, you can get approximate amounts from the graph—sales for January 1981 were about $25,000, while advertising for January was just about zero.

This graph doesn't tell me a whole lot. Correlation between the two lines is not significant.

Plot Strategy

January's advertising and January's sales are plotted on the same line, but perhaps it would make more sense to lag sales behind advertising. Wouldn't January's advertising have an effect on February's sales? Wouldn't the advertising we do in May have a significant effect on June's sales?

Advertising people feel today's advertising produces tomorrow's sales. Thus, to get an accurate picture, you'd need to lag sales figures a month. January's advertising and February's sales should be plotted on the same line. Same with February's advertising and March sales, March advertising and April sales, and so on, all the way across.

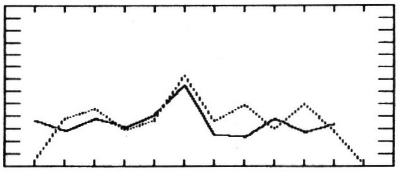

Figure 5. Sales and advertising costs, plotted with a one-month lag to show their relationship.

Figure 5 does just that. The first plots are for January's advertising (dotted line) and February's sales (solid line).

As you go along this graph, you can see a definite relationship between last month's advertising and today's sales. Not all plots correlate

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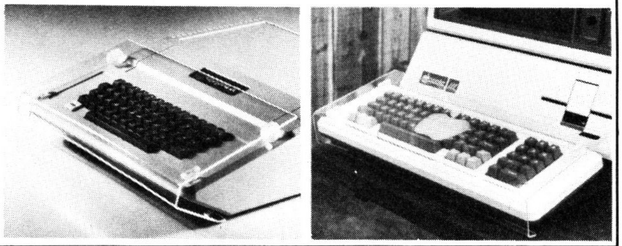

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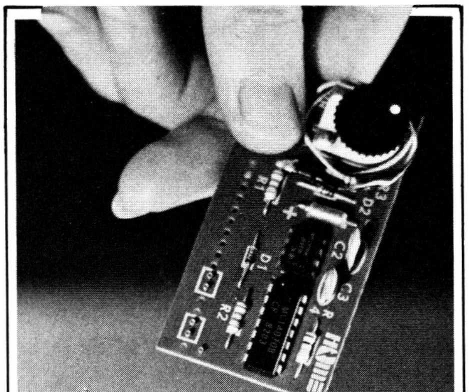

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(there'd be something wrong if they did), but enough do to convince me there's a strong relationship between advertising and sales.

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> **"Can you use today's advertising dollar to predict sales?"**

By the way, after showing the gasoline graphs to our people, our gas costs for September 1982 dropped to $513—down 23%!

Notes to the Reader

Just as a matter of information, the bar graph and fancy line graph were produced using Hi-Res Graph Fit ($28, by Micro-Ware Distributing, PO Box 113, Pompton Plains, NJ 07444). These graphs were all printed on an Epson MX-80 F/T printer, using Graftrix ($65, by Data Transforms, 906 East Fifth Ave., Denver, CO 80218) to produce the hard copies.

Finally, since this is my first business column for *inCider*, I want to include a personal note. As much as I love writing, and as enthusiastic as I am about my two Apples (one at work, one at home), none of this is worth a plugged nickel unless it is of some help to you. I plan to cover both off-the-shelf software and home-grown programs for all types of business applications. I'll stress the big picture—*what* will help your business, *how* it will help and how to use it. Let me know what you like and dislike, and what you want to find out about. I need your help and comments and—believe it or not—I'll answer every letter! ■

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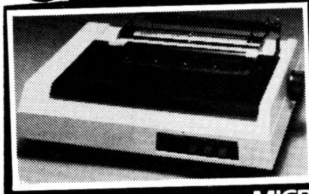

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outCider

by Paul Raymer

The Rebel

I get a great deal of mail from folks in parts of the country where English is not spoken correctly, as we speak it here in Nevada.

Most of the folks are nice, considering that they are Apple computer owners, and seem friendly enough in their letters—but periodically I've had trouble figuring out what they mean.

After a great deal of research at the Clark County Language Research Center and Casino, and with the help of my dear friend Trixie, who is both a research librarian and dyed-in-the-nylon Southern belle, I developed the Rebel program (see Listing 1).

Using the algorithm developed by General Sherman when he visited the lovely state of Georgia in the 1800s, and which was further developed by U.S. Grant's close business relationship with Robert E. Lee, this program will certainly continue to improve relations between the southern states and the rest of us in a similar manner.

The program easily translates regular English words into the phonetic representations one must assume southerners use when they talk. I don't know. I never actually *met* anyone from the South, unless you count Texas.

It must be clearly understood that this program is neither complete nor 100% accurate, but is meant as a starting point from which meaningful things can be done between the two groups.

I have read certain phrases in books about the South that are not incorporated into the program since they apparently have a hostile meaning in certain contexts.

Comments concerning the program are welcome. Additional vocabulary entries should be sent directly to the editors; money may be sent directly to the author. Political controversy is not welcomed.

How It Works

Line 100 is the way we usually start programs out in the West. This clears the screen of any pictures or text you may have had, and returns all variables to zero. Some smart-aleck kids in central California still do things like POKE −16304,0 : POKE −16303,0: CALL −936. It really isn't necessary, you know.

Line 120 warns us that something might go wrong. If it does, the program will go to line 666. We'll worry about it later; probably nothing will go wrong.

Lines 130–160 are credit lines. This is the reward program authors get instead of money.

Lines 170–180 are where the program really begins. The excitement will start to mount as we position the cursor exactly where we want it and then use the command CALL −958. This will certainly impress the other folks in the room watching you, since only *you* will know that CALL −958 clears the screen from the cursor to the end of the page.

We could have easily made line 170 an input sentence; that is:

INPUT "WHAT SENTENCE?";A$

If the answer is more than a few characters long, it would continue on the next line. This gives a neat 40-character line to work with.

Line 190 should be entered this way to format A$ so it can be handled properly in line 500.

Lines 200–320 hold the secret to the whole thing. We are performing an instring search—whatever that is—and trying to find certain sequences of letters within the sentence. If we do—wow—we can *do* something about it.

The For-Next starts at line 200 and finishes at 320. Let's look at line 270, for a specific example.

As the For-Next loop is counting, if it finds three letters in a row that are O-L-D, then it will give the variable S$ the value of OLE. It will assign Y the value of 3. It will go to line 500. Hang in there for an explanation of what happens at line 500.

Lines 330–340 pretty up the spac-

```
100  TEXT : HOME : CLEAR
110  REM  PROGRAM LENGTH=1000
120  ONERR  GOTO 666
130  REM
150  REM
160  REM  IX/XXV/MCMLXXXII
170  VTAB 3: HTAB 1: CALL  - 958: PRINT "WHAT SENTENCE?"
180  PRINT : INPUT "";A$
190 A$ =  CHR$ (32) + A$ +  CHR$ (32) +  CHR$ (32)
200  FOR X = 1 TO  LEN (A$)
210  IF  MID$ (A$,X,3) = "MR " THEN S$ = "MISTER ":Y = 3: GOTO 500
220  IF  MID$ (A$,X,4) = "MR. " THEN S$ = "MISTER ":Y = 4: GOTO 500
230  IF  MID$ (A$,X,3) = "ER " THEN S$ = "AH ":Y = 3: GOTO 500
240  IF  MID$ (A$,X,4) = "YOU " THEN S$ = "Y'ALL ":Y = 4: GOTO 500
250  IF  MID$ (A$,X,2) = " E" THEN S$ = " '":Y = 2: GOTO 500
260  IF  MID$ (A$,X,2) = "ER" THEN S$ = "UH":Y = 2: GOTO 500
270  IF  MID$ (A$,X,3) = "OLD" THEN S$ = "OLE":Y = 3: GOTO 500
280  IF  MID$ (A$,X,5) = "NORTH" THEN S$ = "%#$&*":Y = 5: GOTO 500
290  IF  MID$ (A$,X,3) = "ARE" THEN S$ = "AIR":Y = 3: GOTO 500
300  IF  MID$ (A$,X,5) = "THING" THEN S$ = "THIN":Y = 5: GOTO 500
310  IF  MID$ (A$,X,3) = "ANY" THEN S$ = "INY":Y = 3: GOTO 500
320  NEXT X
330  PRINT
340  PRINT "TRANSLATION:": PRINT
350  INVERSE : SPEED= 50: PRINT A$: SPEED= 255: NORMAL
360  VTAB 22: HTAB 1: PRINT "ANOTHER? (Y/N) ";: GET AN$
370  IF AN$ <  > "N" THEN 170
380  END
500 N$ =  LEFT$ (A$,X - 1) + S$ +  RIGHT$ (A$, LEN (A$) - (X - 1) - Y)
510 A$ = N$: GOTO 200
666  PRINT : INVERSE : PRINT  CHR$ (7);"== SOMETHIN' WRONG...TRY AGAIN! ==
      ": NORMAL : GOTO 170

]
```

Program listing 1. The Rebel.

Paul Raymer (3464 Townhouse Drive, Las Vegas, NV 89121) is a former rancher, known for his short-horns, now working as a professional computer hobbyist.

ing and get ready for the program to show off.

Line 350 looks so innocent, you may very well miss the great social implications in it. What happens here is that the Inverse command was given, speed reduced for emphasis, the sentence was printed in translated form and the speed and text printing were returned to normal. The marvelous part of this all is that the sentence could have been changed a dozen times or more before it was printed and no one would ever know it.

Lines 360–380 are not original. They were copied from a graphics program I bought for $50, and this was the only part I could understand.

Line 500 is a gem. This is the line that really does all the work, and in such a clever manner.

We take the original sentence, use the LEFT$ part of it (because the program jumped here when it found a match) and then replace the wrong word with the right word (S$) and add the rest of the original sentence again, using the Y as a starting point. We have now made a new sentence, with *one* correction in it.

The program then returns to line 200 to take another crack at it. When it can find no more to do, it will quit coming here and print the translation in line 350.

Line 666 will catch any mistakes you make when you enter nasty words, dumb things or phone numbers.

Note how certain phrases were selected; in line 230 the midstring is E-R-space, to insure that this change will only be made when ER is at the end of a word.

You may want to try some simple

```
100  TEXT : HOME : CLEAR
110  REM
120  REM
130  REM
140 BZ =  - 16336
150  INPUT "WHAT MODERN NUMBER? ";N
160  IF N > 80 THEN  HOME : GOTO 150
170  IF N < 1 THEN  END
180  SPEED= 200
190  HOME
200  INVERSE
210  FOR X = 1 TO N
220  IF X > 20 THEN L = 5
230  IF X > 40 THEN L = 10
240  IF X > 60 THEN L = 15
250  IF  INT (X / 5) = X / 5 THEN  GOTO 370
260  FOR Y = 1 + L TO 5 + L
270  VTAB Y: HTAB 2 * X: PRINT " "
280 PG =  PEEK (BZ)
290  NEXT Y
300  VTAB 24: HTAB 3: PRINT X;
310  NEXT X
320  NORMAL
330  FOR W = 1 TO 2000: NEXT W
340 Z =  PEEK (2002):Z1 =  PEEK (2003)
350  FOR I = 3 TO 37: POKE 2000 + I,Z: POKE 2001 + I,Z1: POKE 1999 + I,160
     : FOR W = 1 TO 100: NEXT W:PG =  PEEK (BZ) +  PEEK (BZ): NEXT I
360  VTAB 23: HTAB 1: SPEED= 255: END
370  REM

         FIVE MARKER

380  VTAB 3 + L: HTAB 2 * X - 9: PRINT "      ": FOR O = 1 TO 20:PG =  PEEK
     (BZ): NEXT O: GOTO 300
390  REM

          INSTRUCTIONS:

400  REM
     N
     O
     N
     E

410  REM  REM
]PR#0
```

Program listing 2. Crow-Magnum mystery program.

sentences at first like:

HOW ARE YOU?

ARE THINGS GOING WELL UP NORTH?

IT IS COLD IN NEW JERSEY IN THE WINTER

and then

MR. RAYMER AND PAUL'S ELECTRIC COMPUTER ARE AN OLD WESTERN PERSONAL COMPUTER GROUP INVOLVED IN MANY EXCITING THINGS.

Have fun!

Crow-Magnum Counting System

When I was advised that The Rebel was going to be published in *inCider*, I was so excited that I showed the postcard from the editors to everyone I met. Most folks just looked the other way, some crossed the street to avoid talking to me, one guy laughed when he saw the postmark "NH" and said, "There is no such a place." Perhaps he was correct.

Then, outside the stage entrance to the Nevada Library and Dance Hall, I was approached by a tall, mean, Texas-cowpoke-looking woman who said she had heard about my unfriendly program about the South and asked that I prove my openmindedness by presenting a program her brother had written.

This program, Crow-Magnum, (see Listing 2) is based on information she had written on the back of a Lone Star beer label. I have taken some liberties with her version to prevent the program from getting too ponderous, plodding or pedestrian.

Apparently her brother Neal had intended to depict a series of counting sequences, but the GR command on his Apple (and he has an *old* version) didn't work—so the entire program is written in text. It is quite amusing, about as amusing as Sam Houston found things when he and General Ana met in El Paso, or Houston, or Fort Worth or wherever.

The program is very short, will not take long to enter, and can quickly be erased from your Apple by typing the command "NEW".

How the Program Works—If At All

Lines 100–130 only clear the screen and get everything ready to go.

Line 140 assigns a value to BZ. You can tell noises are about to happen later when you see the – 16336.

Lines 150–190 get a value for N. The rest of the stuff is to make sure the number is not bigger than 80, nor less than 1. Then the speed is reduced and the screen cleared. Seems like an awful lot of work, and you wouldn't have to bother with it if everyone did everything right in the first place.

Line 200 makes things *inverse*. We call this an Inverse command because everything will now be inverse until we tell it to be normal. Gives a programmer a great sense of power to have that ability, don't you think?

Lines 210–310 are going to do all the work.

Line 210 decides how many times whatever it was that Neal had in mind to happen, will happen.

Lines 220–240 determine on what part of the screen to print. As the value of X gets larger, the further down (south) the image will print. This is done in steps of five for some reason known only to Neal, his sister and General Houston.

Line 250 is real neat. It only does whatever it does when X is *exactly* five! This is known as the Cinco de Mayo effect. Sometimes, programmers who don't want to know when a program counts exactly five will "hold the mayo."

Lines 260–290 draw lines. It will look like graphics. This is similar to the command GR and VLIN whatever to whatever, but as explained earlier, Neal's GR command didn't work. If your thing doesn't work sometimes, you may want to try this.

(Did you notice how line 280 was snuck in to make a little noise every time a plot was made on the screen?)

Line 300 prints the value of X on the screen as proof that something is happening. Sometimes this program becomes so complex that you might forget that your computer need not be used for serious mathematical computations all the time and should periodically be used for fun, games, play, entertainment. It also gives the

SQR, TAN, COS, LOG, SIN and EXP functions in ROM a chance to rest up a bit.

Line 320 returns the program to normal. This means the power gained by employing the Inverse function has now been returned to your computer. Don't be depressed. More excitement is to come!

Line 330 is a delay loop. This is a chance to show your creativity. You may use the variable Z (for ZZZ) or H (for Hang in there) or whatever you wish (I used W for Wait) and then you can choose any numbers. I used 2000, since that is the year when my last house payment will be made. Well known programmers like Bert Kersey use numbers like 1234 (shows freedom of spirit); Neil Konzen uses 3D0G (to indicate Floating Point Integer); I can't say what Ed Zaron of Muse uses since my Super-Text program is protected so well; and the guys at Sensible Software use D5 AA FF, because they talk that way in Michigan.

Lines 340–350 are truly state of the art for Apple programming. This algorithm, when completely mastered, will enable you to write programs like PacMan, Defenders, Donkey Kong and Road Apples—programs now available only on non-Apple computers. This little routine basically looks at two specific screen locations, memorizes what is there, and at blistering speed (for Basic, that is) transports that information across the video screen.

Line 360 returns the cursor to bottom of screen, returns speed to normal and ends the program, not knowing that more is to come in the listing.

Lines 370–380 comprise the subroutine that performs the graphic display required by line 250 above. This complex type of programming cannot be accomplished by mathematical calculation. It must be done by trial and error, since nothing this bold has been done since David Ahl invented the computer in about 1967.

Lines 400–4000 are not required, since there were no instructions with this program. There were, of course, but they were unintelligible and so are not being presented at this time.

While not the original intent of the author, this program is dedicated to those math students, financial wizards and computer buffs who delight in numbers—this program will show the outside world that binary, hex, decimal and Roman are not all that man/woman lives by.

My thanks again to Neal Andrathaal and his stalwart sister for their insistence that this program be foisted upon an unsuspecting public. ■

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SAVVY

Fudge It!

by Don Fudge

A renowned expert puts graphics shapes at your fingertips.

Vector Graphics Made Easy

This is the first of many Apple graphics columns I plan to do. There's little danger I'll run out of material—the Apple can do more tricks than all the dogs and magicians who ever lived (combined). For openers, I've chosen shapes.

Some computers contain a special graphics chip that allows sprite shape animation. With sprites, the hardware supports the movement of whole shapes or shape segments when sprite coordinates are changed. Shape superimposition is handled by video display planes up to 35 levels deep.

The Apple, however, has no special graphics chip—graphics must be processed through Apple's 6502 microprocessor. You can add peripheral boards containing any number of special chips to give your Apple super arcade quality animation and graphics. But without such hardware assistance, Apple users must be content to operate within the limitations of 6502. One of the 6502's limitations is its 8-bit capacity; a 16-bit microprocessor, such as the Motorola 68000, would be 10–100 times faster for graphics applications (see *CALL A.P.P.L.E.*, April 1982, pp. 15–17, "68000 BOARD").

The Texas Instruments TMS 9918A Video Display Processor is a multimode graphics processor now available on an Apple peripheral board (call me if you want more information). It's a perfect example of a chip that will give you better, faster graphics and use of sprites.

Okay, enough of admiring the greener grass on the other side of the microchip. Staying within the limitations of Apple's 6502, a microprocessor I've come to know and love, what can you do with shapes?

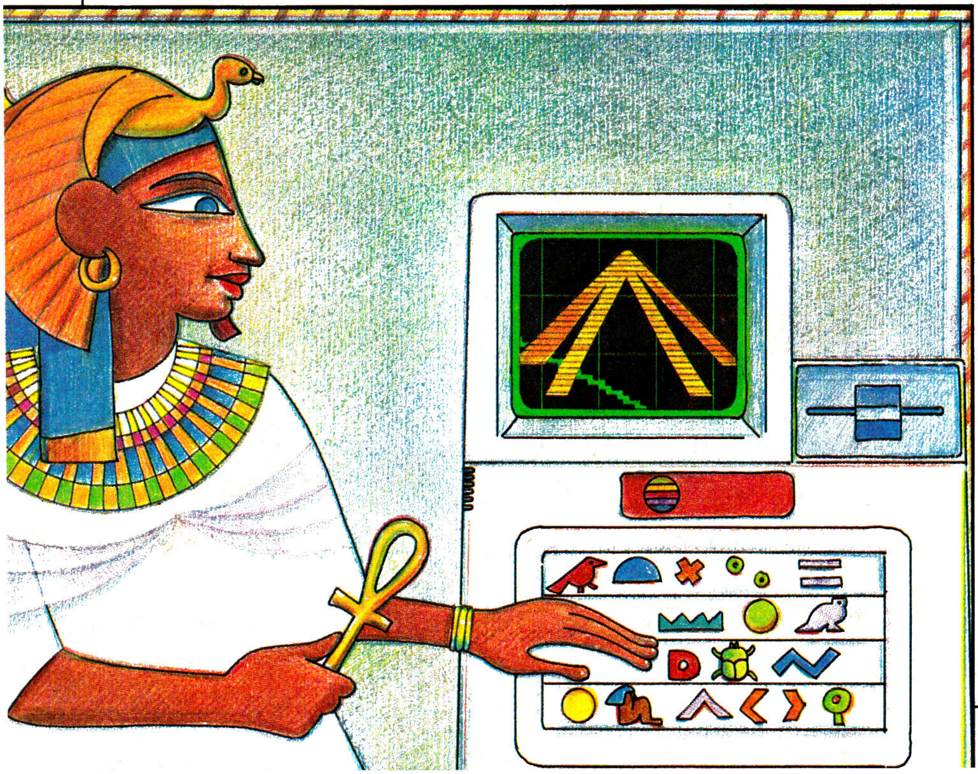
Well, staying within Applesoft Basic, you could use standard Applesoft shape tables and Applesoft's convenient DRAW, XDRAW, ROT, SCALE, HCOLOR and (if you're silly enough to use shapes on tapes) SHLOAD commands. You can draw these shapes in whatever orientation (ROT = rotation) or scale you like. The only problem is that the Applesoft manual gives an extremely primitive method for creating shape tables (pp. 92–100). With their method, shape creation and shape saving are an unmitigated pain in the assembler.

I know that anyone interested in creating Applesoft vector shapes will want to avoid doing it the hard way, so I'm including a printout of a program (one of the ones from Avant-Garde Creations' Super Shape Draw and Animate package) that will allow you to create shapes the easy way.

I'll be referring to such shapes as vector shapes, since Apple uses the term vector to describe its directional plot-or-move arrows used in shape table calculations.

Vector shapes are one of three main types of shapes supported by the Apple. Remember, creating faster and better graphics via 16-bit CPU utilization or sprite graphics chips requires extra (peripheral) hardware, so I won't consider sprites here. The other two are hplot shapes (see next month's column) and block shapes (see the column two months from now) that some folks call raster or bit-mapped shapes.

If you're reading this column you almost certainly own or have access to the *Applesoft Manual*. For more



Address correspondence to Don Fudge at Avant-Garde Creations, PO Box 30160, Eugene, OR 97403.

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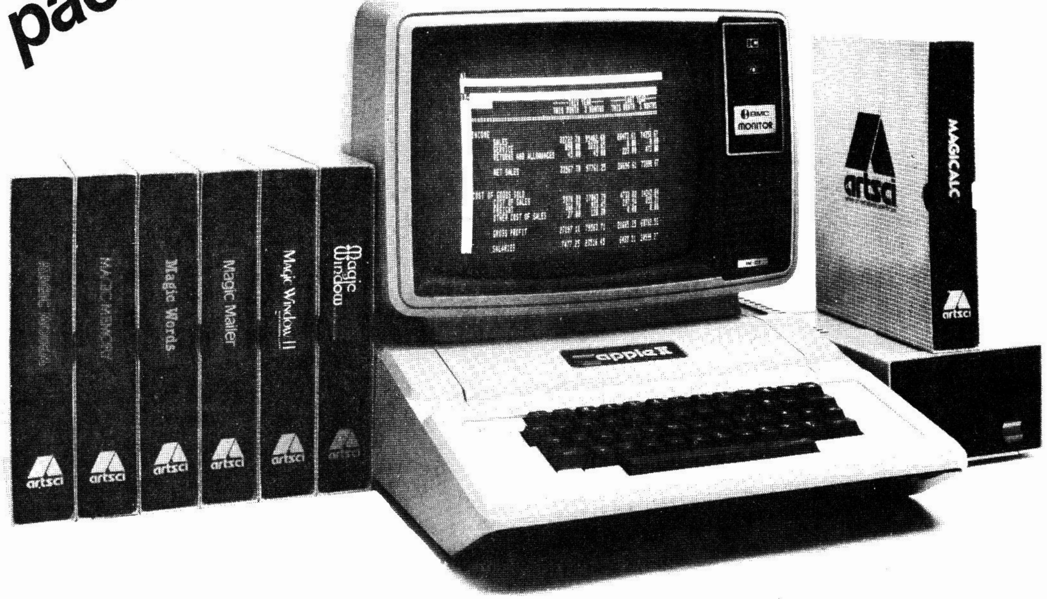

but the MAGIC goes on...

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information on vector shapes, see pp. 92–100.

Here now is a nice little Applesoft Basic program to make shape creation a snap for you (see Listing 1). May it save you from much needless wasted time.

By the way, Shapedrawing will not work unless you POKE103,1: POKE104,64:POKE16384,0 before running it (you may do this in a Hello program than runs Shapedrawing after the Pokes). Also, leave HIMEM at default 38400.

Much of the Shapedrawing program is dedicated to making editing possible. The program would be much shorter if not for the E and W commands, and having diagonal plotting as well as horizontal and vertical plotting. Also lengthening the program is the Unlimited Move-up feature. Perhaps you're aware that move-ups without plotting are equal to 0, so that if you do several in a row you'll end up with a hex byte of 00 for your shape table, *which would mean "end of shape."*

In line 640 the table byte is calculated. If it's 00 then we end up at line 660 rather than 670, which changes 00 to 128 or $80 and changes the impact of the line to two move-ups and one move-down, or one move-up in net effect (128 = $80 = 10 000 000 = down up up). A $80 byte does not signal "end of shape," so the shape continues.

Most of the rest of the program is too complex to discuss here—it would take half the magazine. So let's turn to the instructions for using this program to create nice, fast, easy-to-do shape tables—after one last consideration.

I recommend the program because I've often drawn dozens of shapes at one sitting with very few errors and very little need to edit. The program automatically saves all your shapes into an indexed Applesoft shape table once you're done; just signal control-S (stop). If you decide you need programs to edit, continue where you left off, examine shape tables, and animate, or if you're too busy to type in the program listings and want a 50-page

Program listing 1. Shapedrawing program.

```
0  ONERR  GOTO 63990
1  GOTO 114
2 GH = 1: RETURN
3  IF BYTE - BE >  = 986 AND FA <  > 1 THEN  POP : GOTO 18999
4  RETURN
5  IF KEY = 172 THEN OLDY = OLDY - 1:DX = DX - 1
7  IF KEY = 172 AND K9 = 1 THEN OLDY = OLDY + 2
8  IF KEY = 213 AND K9 = 5 THEN OLDY = OLDY - 2
9  IF KEY = 206 THEN OLDY = OLDY - 1:DX = DX + 1
11  IF KEY = 207 THEN OLDY = OLDY + 1:DX = DX + 3
13  IF KEY = 213 THEN OLDY = OLDY + 1:DX = DX - 3
15  IF KEY = 207 AND K9 = 3 THEN OLDY = OLDY - 2
16  IF KEY = 206 AND K9 = 7 THEN OLDY = OLDY + 2
20  RETURN
30 TK = K8:K8 = K9: IF K8 = 215 AND K9 = 215 THEN K8 = TK
31  RETURN
114  CALL  - 936: INPUT "NUMBER OF SHAPES IN TABLE?(1-126):";NU
115  IF NU > 126 OR NU < 1 THEN 114
116 NB = 0
118 WQ = 2
119  DIM XX(1001),YY(1001)
130  DIM C(3):C(1) = 0:C(2) = 0:C(3) = 0
145 ADR = 2360
150 LOC = 2360:X = 139:Y = 79
151  POKE LOC,1: POKE LOC + 2,4: POKE LOC + 3,0:LOC = LOC + 4:LC = LOC
152  POKE LOC + 1,0
153 PFLAG = 0:LL =  FRE (0): CALL 54915:AF = 0: IF ZX = 1 THEN LOC = LOC +
     1
154 BE = BYTE:FA = 0
159  IF AA = 1 THEN AA = 0:AF = 1
160  HGR : HCOLOR= 3: ROT= 0: SCALE= 1:N = 0:C(0) = 8: GOSUB 550
170  VTAB (22): PRINT "BYTE  NE=O  N=I  NW=U   PLOT MODE:"
175  FLASH : VTAB 22: HTAB 36: PRINT "OFF": NORMAL
180  VTAB 23: PRINT "ROOM: E=L   W=J"
190  VTAB 24: PRINT "5828  SE=,  S=M  SW=N   BYTES USED:  "
195  VTAB 22: HTAB 25: PRINT "SHAPE:    "
199  VTAB 23: HTAB 37: PRINT BYTE - BE + 4
200  GOSUB 30: POKE  - 16368,0: IF SG > 0 THEN 31000
201 K8 = K9: VTAB 23: PRINT "     ": VTAB 23: PRINT 8192 - LOC: GOSUB 3:K9 =
     KK
203 KK = KEY:LF = 0
204  VTAB 22: HTAB 32: PRINT NB + 1
205 KEY =  PEEK ( - 16384): IF KEY < 128 THEN 205
206  IF GH = 1 THEN 900
207  GOTO 211
208  GOSUB 5
211 GH = 0: IF KEY = 197 THEN 25000
212 SV = 0:FF = 0:TT = 0: IF KEY = 215 THEN 2300
219  IF KEY = 133 THEN 20000
220  IF KEY = 208 THEN KEY = KEY - 176
221  IF KEY = 134 THEN 420
222  IF KK = 215 THEN  GOSUB 2400: IF K9 > 0 AND K9 < 9 THEN  GOSUB 2330
223  IF KK = 215 AND K9 = 215 THEN  GOSUB 2730
225  IF KEY = 147 THEN ZZ = 1: GOTO 420
231  IF KEY = 207 THEN KEY = 1: GOTO 300
232  IF KEY = 203 OR KEY = 204 THEN KEY = 2: GOTO 360
233  IF KEY = 172 THEN KEY = 3: GOTO 330
234  IF KEY = 205 THEN KEY = 4: GOTO 330
235  IF KEY = 206 THEN KEY = 5: GOTO 330
236  IF KEY = 202 THEN KEY = 6: GOTO 390
237  IF KEY = 213 THEN KEY = 7: GOTO 300
238  IF KEY = 201 THEN KEY = 8: GOTO 300
245  IF KEY <  > 32 THEN 200
250 PFLAG =  NOT PFLAG
260  VTAB 21: HTAB 36: IF PFLAG = 0 THEN 280
270  PRINT "ON ": GOTO 200
280  FLASH : PRINT "OFF": NORMAL
290  GOTO 200
300  IF OLDY = 0 THEN 200
305 Y = OLDY - 1
310 C(N) = 0: IF PFLAG = 1 THEN C(N) = 4
315  GOSUB 550
320  IF KEY = 7 THEN 390
322  IF KEY = 1 THEN 360
324  GOTO 200
330  IF OLDY = 159 THEN 200
335 Y = OLDY + 1
340 C(N) = 2: IF PFLAG = 1 THEN C(N) = 6
345  GOSUB 550
350  IF KEY = 5 THEN 390
352  IF KEY = 3 THEN 360
354  GOTO 200
360  IF DX = 279 THEN 200
365 X = DX + 1
```

Listing continued.

Z80 CP/M[1] SOFTWARE

HIGH QUALITY — LOW COST

Overbeek Enterprises is committed to providing quality software at extremely low prices. We achieve this by reducing overhead to essentially marketing and reproduction costs. We rely on responses from ads, rather than a distribution network. We invite you to consider the following two products.

$25 Micro-WYL

A powerful, Z80 CP/M text editor

Tired of trying to use ED under CP/M? This is the editor developed by Realworld Software, Inc. and reviewed in Infoworld (11/15/82).

– Here are quotes from customers and reveiwers –

"Micro-WYL is undoubtedly the hottest software bargain on the market"

"thank you, thank you, thank you"

"Micro-WYL is truly terrific"

– Those are quotes from unsolicited letters from our customers.

"While I am an avid Wordstar user, I personally prefer the ease and convenience of Micro-WYL when writing programs. The price is right and the product is great. Try it. This editor has numerous features not described in this review – all of which help to make this product an essential part of your program base."

– From a review in the PASCAL MT Users Group Newsletter.

"This editor is perfect for writing in nearly any programming language. [I] . . . find myself looking for excuses to use Micro-WYL, and certainly have no hesitation in recommending it to anyone whose requirements match the capabilities of this inventive piece of software."

– From a review in Infoworld (11/15/82)

We do offer a great editor at an unbelievably low price. WYLBUR[2] has been popular on IBM mainframes for over a decade.

Now you can have the convenience of WYLBUR on your micro.

$29.95 DISK INSPECTOR

a program that runs under Z80 CP/M[1] for disk inspection and modification

Have you ever been unable to read a file due to a bad sector? Have you ever erased the wrong file? Disk Inspector acts as a full-screen editor for diskettes. You can simply watch as sectors are displayed on the screen in both character and hex formats. When you wish to make the display pause, touch the spacebar. If you wish to alter a sector, it is a simple matter to move the cursor over the appropriate character, alter it, and have the sector rewritten.

Although Disk Inspector runs under CP/M you can inspect and alter normal (non CP/M) Apple diskettes, as well. The disk drives may be single or double density, single or double sided. The comprehensive manual will show you how to:

Recover an erased file.
Modify a director entry.
Clean up a directory.
Utilize the CP/M Auto-Load feature.
Create multiple directory entries.
Read and modify non CP/M diskettes.

The Disk Inspector is a full-screen editor for disks. Our competitors offer products in the $100–$200 range. We certainly invite comparison of this product with any comparable system in terms of features or user friendliness. In terms of price, there is no comparison.

Note: Disk Inspector requires an 80 x 24 screen on your CRT and is currently available only in 8" SSSD, Kaypro, Apple/Softcard, NEC, and Altos Series 5 formats.

☐ **Apple/Softcard**
☐ KAYPRO II 5"
☐ 8" SSD
☐ NEC 5"

☐ ALTOS Series 5
☐ Televideo TS-802
☐ Osborne
☐ Superbrain

Northstar 5" DD
☐ Advantage
☐ Horizon

Amount:	$25 for Micro-WYL	________
	$29.95 for Disk Inspector	________
	$2 for postage & handling	________
	Total	________

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Elgin, IL 60120

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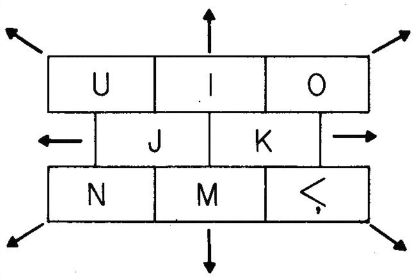

Figure 1. Keyboard commands to move cursor.

manual as well, give me a ring—what you need *is* available.

Now for the instructions:

The commands in this program are:

W = wipe out the last several plot-points.

Control-E = erase the whole shape and start over.

Control-S = stop and save.

Control-F = this shape finished, let's go on to drawing the next shape in the table.

E = edit (erase the last point plotted).

P = plot/don't plot toggle switch.

The keyboard commands that move the cursor around are shown in Figure 1. When the plotter is on, the cursor commands cause moves plus point-plots. When the plotter is off, the cursor commands cause moves only—no plotting.

L also works for moving right.

Not having to turn the plotter off and on during diagonal plotting is convenient. (Incidentally, if you want shapes to scale up nicely, always leave the plotter on and use only I, J, K, M or L.)

Here's more detail on the commands:

Control-E = erase, the shape's no good; restart.

Control-S = the entire shape table is complete so save it on disk now (you'll give a file name).

Control-F = the shape you're on is done so go on to the next one in the table.

E = erase last single plot only. Edits only one dot. Do not try to hit more than one E in a row—you'll wreck the shape. To erase more than one dot, use W.

P = the plotter toggle; it turns the plotter on if it's off and off if it's on. Have it on to plot and off to move without plotting.

W = wipe out several plot points.

Listing continued.

```
370 C(N) = 1: IF PFLAG = 1 AND KEY = 2 THEN C(N) = 5
380  GOSUB 550: GOTO 200
390  IF DX = 0 THEN 200
395 X = DX - 1
400 C(N) = 3: IF PFLAG = 1 AND KEY = 6 THEN C(N) = 7
410  GOSUB 550: GOTO 200
420  CALL  - 936
430 B = C(1) + C(2) * 8 + C(3) * 64: POKE LOC,B
440  IF B = 0 AND BYTE > 0 THEN 460
450 LOC = LOC + 1: POKE LOC,0:BYTE = BYTE + 1
460  GOTO 480
472  POKE SOI + 2,(2 * NU) + 2: POKE SOI + 1,0: POKE SOI + 3,0: POKE SOI,N
     U:ADR = SOI
473  VTAB 21: FLASH : PRINT "PLEASE REMOVE THIS DISK & REPLACE IT    WITH
     YOUR OWN INITIALIZED DISK NOW!         (HIT ANY KEY TO CONTINUE)"
474  POKE  - 16368,0: GOSUB 23010: NORMAL :D$ =  CHR$ (4): HOME
475  VTAB 23: INPUT "SHAPE TABLE NAME: ";N$
476  PRINT D$;"BSAVE";N$;",A";ADR;",L";(LOC + 2) - ADR
477  HOME : TEXT
479  PRINT "SHAPE TABLE SAVED": GOTO 5000
480  IF NU = 1 THEN SOI = 2360: POKE SOI,NU
481  IF NU = 1 THEN 472
482  IF NU = 2 AND NB = 0 THEN SOI = 2358:ADR = 2358: GOSUB 1000
483 BT = BYTE:L1 = LOC
485 NB = NB + 1: IF NU > 2 AND AF = 0 THEN  GOSUB 2000
486  IF NU > 2 THEN LC = LOC
487  IF NU = NB OR ZZ = 1 THEN 472
488 Y = 79:X = 139
489 C(1) = 0:C(2) = 0:C(3) = 0:ZX = 1: GOTO 153
550 TC = C(N):TN = N: IF C(N) > 3 THEN 580
560  HCOLOR= 0: HPLOT DX,OLDY
580  HCOLOR= 3: HPLOT X,Y
600  IF N > 2 THEN  GOSUB 620
602  IF C(2) = 0 THEN  IF N = 2 AND C(1) > 0 THEN  GOSUB 16000
605  IF BYTE > 0 THEN OY = OLDY
606  IF BYTE > 0 THEN OX = DX
610 TT = TT + 1:N = N + 1:DX = X:OLDY = Y: RETURN
620  IF C(3) < 4 AND C(3) > 0 THEN 640
630 SA = C(3):C(3) = 0
635 SV = 1
640 B = C(1) + C(2) * 8 + C(3) * 64
645 C1 = C(1):C2 = C(2):C3 = C(3)
650  IF B <  > 0 THEN 670
660 B = 128: POKE LOC,B:LOC = LOC + 1:BYTE = BYTE + 1:XX(BYTE - BE) = X:YY
     (BYTE - BE) = Y
670  POKE LOC,B:LOC = LOC + 1:XX(BYTE - BE) = X:YY(BYTE - BE) = Y
680 BYTE = BYTE + 1: VTAB 23: HTAB 37: PRINT "    ": VTAB 23: HTAB 37: PRINT
     BYTE + 4 - BE
690  IF C(3) = 0 THEN 710
700 C(1) = 0:C(2) = 0:C(3) = 0:SA = 0:N = 0: RETURN
710 C(1) = SA:C(2) = 0:C(3) = 0:SA = 0:N = 1: RETURN
720  END
850  IF K9 = 2 AND (KEY = 204 OR KEY = 203) THEN 899
851  IF K9 = 4 AND KEY = 205 THEN 899
852  IF K9 = 6 AND KEY = 202 THEN 899
853  IF K9 = 8 AND KEY = 201 THEN 899
854  GOTO 3000
855  ON K9 GOTO 860,865,870,875,880,885,890,895,899
860  IF KEY > 201 OR KEY < 205 THEN X = X + 2: GOTO 899
865  IF KEY = 201 OR KEY = 205 THEN X = X - 1: GOTO 899
870  IF KEY > 201 OR KEY < 205 THEN X = X - 2: GOTO 899
875  IF KEY > 201 AND KEY < 205 THEN Y = Y - 1: GOTO 899
880  IF KEY > 201 OR KEY < 205 THEN X = X + 2: GOTO 899
885  IF KEY = 201 OR KEY = 205 THEN X = X + 1: GOTO 899
890  IF KEY > 201 OR KEY < 205 THEN X = X - 2: GOTO 899
895  IF KEY > 201 AND KEY < 205 THEN Y = Y + 1
899 HG = 0: GOTO 211
900  IF KEY > 200 AND KEY < 206 THEN HG = 1
905  IF HG = 0 THEN 910
907  IF HG = 1 THEN 850
910  IF K9 = 8 THEN Y = Y + 1: GOTO 211
915  IF K9 = 4 THEN Y = Y - 1: GOTO 211
920  IF K9 = 2 AND (KEY = 207 OR KEY = 213) THEN Y = Y - 1:X = X - 1: GOTO
     211
925  IF K9 = 2 AND (KEY = 206 OR KEY = 172) THEN X = X - 1:Y = Y - 1: GOTO
     211
940  IF K9 = 6 AND (KEY = 207 OR KEY = 213) THEN Y = Y - 1:X = X + 1: GOTO
     211
945  IF K9 = 6 AND (KEY = 206 OR KEY = 172) THEN Y = Y + 1:X = X + 1: GOTO
     211
999  GOTO 208
1000  POKE SOI,NU: POKE SOI + 2,6: POKE SOI + 3,0: POKE SOI + 5,0: IF BYTE
      + 7 < 256 THEN  POKE SOI + 4,7 + BYTE: RETURN
1004 GG =  INT ((BYTE + 7) / 256): POKE SOI + 5,GG
1006 HH = (BYTE + 7) - ( INT ((BYTE + 7) / 256) * 256): POKE SOI + 4,
```

Listing continued.

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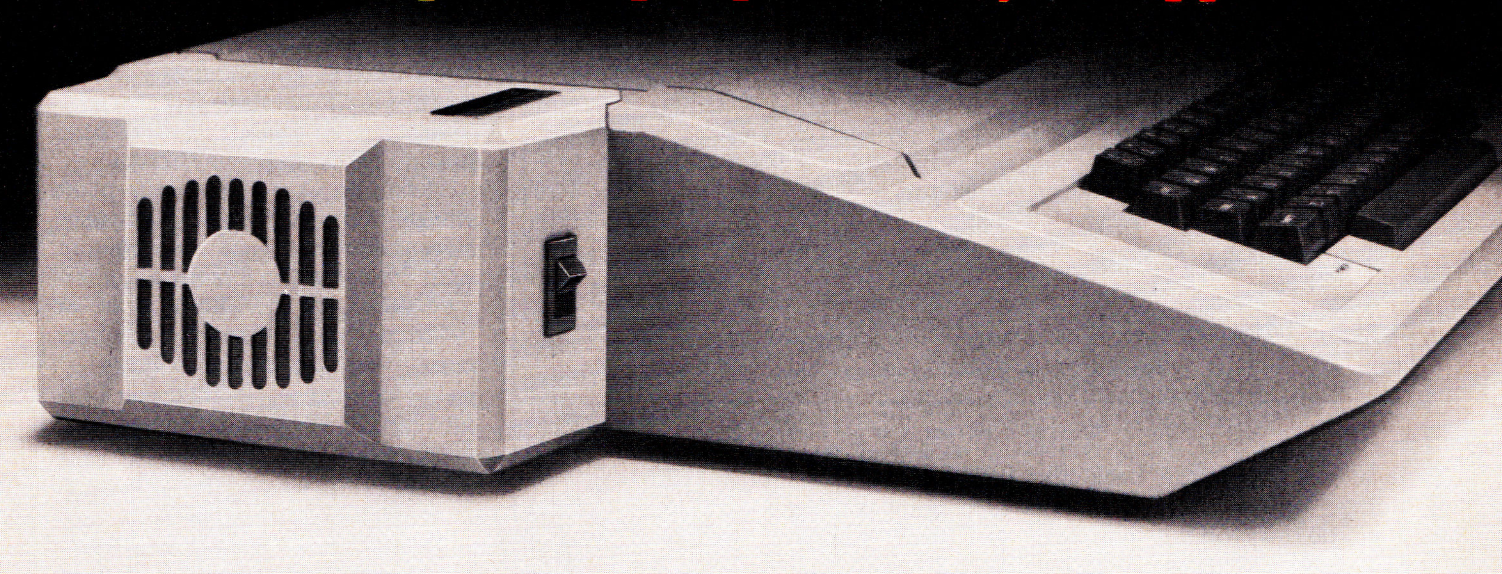
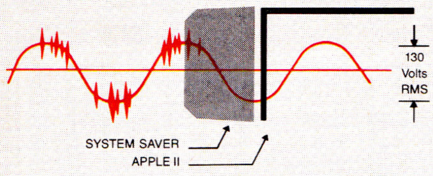
System Saver™

The most important peripheral for your Apple® II.



For Line Surge Suppression

The SYSTEM SAVER provides essential protection to hardware and data from dangerous power surges and spikes.

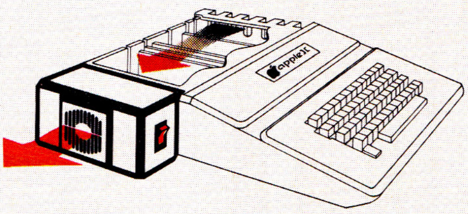


By connecting the Apple II power input through the SYSTEM SAVER, power is controlled in two ways: 1) Dangerous voltage spikes are clipped off at a safe 130 Volts RMS/175 Volts dc level. 2) High frequency noise is smoothed out before reaching the Apple II. A PI type filter attenuates common mode noise signals by a minimum of 30 dB from 600 khz to 20 mhz, with a maximum attenuation of 50 dB.

For Cooling

As soon as you move to 64K RAM or 80 columns on your Apple II you need SYSTEM SAVER.

Today's advanced peripheral cards generate more heat. In addition, the cards block any natural air flow through the Apple II creating high temperature conditions that substantially reduce the life of the cards and the computer itself.



SYSTEM SAVER provides correct cooling. An efficient, quiet fan draws fresh air across the mother board, over the power supply and out the side ventilation slots.

For Operating Efficiency

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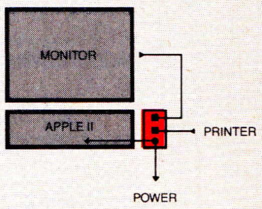

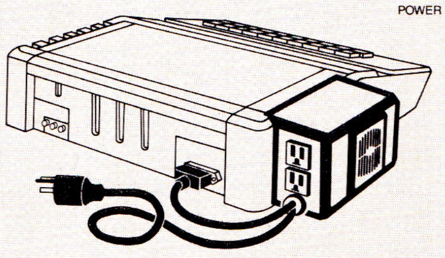

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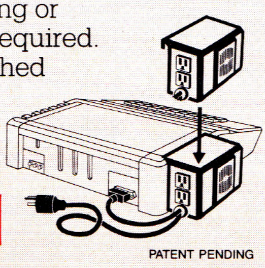

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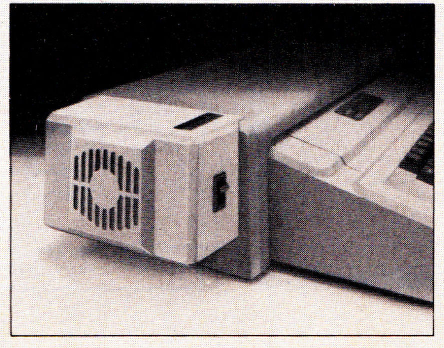

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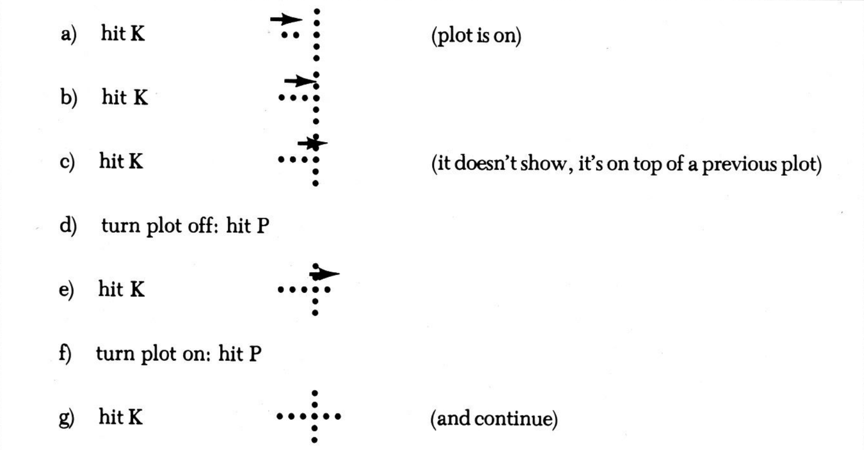
a) hit K (plot is on)

b) hit K

c) hit K (it doesn't show, it's on top of a previous plot)

d) turn plot off: hit P

e) hit K

f) turn plot on: hit P

g) hit K (and continue)

Figure 2. Proper sequence for line crossing.

It allows you to go back and fix things. You may *not* hit a series of E's to do this; you *may* hit a series of W's, however. (But if much of the shape needs fixing, or if a mistake was made early in the drawing, the smart way is to go back and restart with the Control-E command.)

A few words about the W command: It does complex things and must be handled "just so." Here's a rule: Always make sure that the point you plot *after* using W is plotted in the same direction as the last visible dot on the screen was plotted relative to the plot before it. In order to accomplish this, you'll sometimes have to hit W twice in a row.

Here's another rule: If the point you plot after hitting W gives you a screen dot that is not continuous with the rest of the shape, or is otherwise defective, then hit W once or twice more and then plot the next point in the same direction as the last visible point-plot. So, if you hit I *before* hitting W, then you must hit I once you're done hitting W's (if you're still trying to move upwards; I means up in Shapedrawing).

When crossing a line with another

Shape #	1	2	1	2	1	2	1	2
	↑	↗	→	↘	↓	↙	←	↖
ROT =	0	0	16	16	32	32	48	48

Figure 3. Setup for shape rotation.

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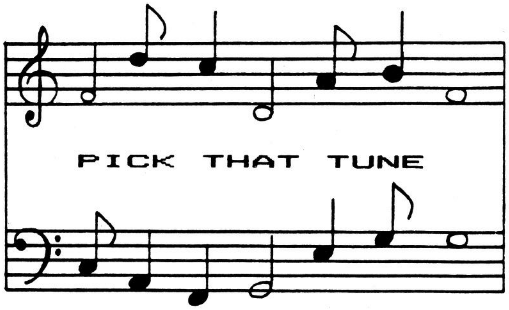
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shape line, you'll need to know that the last dot you made is an arrow (vector direction), not a plot. That's why, even though other shape-drawers always seem to be one step behind where you are, my program will make you feel that the drawing is right with you; this is much easier to deal with as a utility, as you'll see.

The proper sequence for line crossing is shown in Figure 2.

Another thing you should know is that, before you hit control-S or control-F, you must first add an extra dot, because the last dot is the vector arrow, not the vector plot. Failing to plot an extra dot (it should aim in the same direction that you're traveling) will result in a dot missing from your shape (the last one "plotted").

You'll need to know about center-referencing. Shapes are drawn with commands like DRAW 1 AT 79,68 or DRAW 99 AT 87,4. The two numbers are the coordinates (X,Y) of the shapes' reference (starting) point; the shapes will pivot on this point during rotations (ROT). If you want a center-referencing shape (which rotates like a wheel on an axle), make sure you start drawing in the center of the shape. (It's okay to leave the plotter off until you reach a shape edge and then hit P to start plotting.)

You'll also want to know how to set up a shape that rotates completely; a rocket ship must pivot in every direction as it shoots at asteroids coming at it from all sides. Simply draw one rocket facing straight up (north), and another facing diagonally (45 degrees) to the northeast. Make the dimensions of the second rocket ⅔ or 70 percent of the first rocket's dimensions, or the rocket's size will grow/shrink unrealistically upon rotation. The setup is shown in Figure 3.

You'll notice, if you look at a colored scene on a black and white monitor, that color is created by plotting every other dot horizontally across the screen. Keep this in mind when you draw your shapes. For instance, you can take any shape and set HCOLOR to 0–7 and draw the shape in that color. But if you're us-

Listing continued.

```
2000 SOI = 2364 - (NU * 2) - 2: POKE SOI,NU
2005  IF NB = 1 THEN  POKE SOI + 2,(NU * 2) + 2
2010 ADR = SOI
2011  IF NB = 1 AND NU <  > 2 THEN  RETURN
2012 WQ = WQ + 2
2015  IF ((LC - SOI) + 1) > 255 THEN 2030
2020  POKE SOI + WQ,(LC - SOI) + 1
2022  POKE SOI + WQ + 1,0
2025  RETURN
2030 GG =  INT (((LC - SOI) + 1) / 256)
2040  POKE SOI + WQ + 1,GG
2050 HH = ((LC - SOI) + 1) - ( INT (((LC - SOI) + 1) / 256) * 256)
2060  POKE SOI + WQ,HH
2070  RETURN
2100 SOI = 2364 - (NU * 2) - 2: POKE SOI,NU
2101  IF AF = 1 THEN  RETURN
2102  IF AF = 0 THEN AF = 1
2103  IF NU = 2 AND NB = 1 THEN  RETURN
2105  IF NB = 0 THEN  POKE SOI + 1,0: POKE SOI + 3,0: POKE SOI + 2,(NU * 2
     ) + 2: RETURN
2106 NB = NB + 1: GOSUB 2000:NB = NB - 1
2110  RETURN
2300 LOC = LOC - 1: POKE LOC,0:BYTE = BYTE - (BYTE > 0): HGR : ROT= 0: SCALE=
     1: HCOLOR= 3
2301 LL =  FRE (0)
2303  GOSUB 2100
2305 C(1) = 0:C(2) = 0:C(3) = 0:N = 0
2308 D =  INT (SOI / 256):T = D * 256:SM = SOI - T
2310  POKE 232,SM: POKE 233,D: DRAW NB + 1 AT 139,79
2325 DX = XX(BYTE - BE - 1):OLDY = YY(BYTE - BE - 1):X = XX(BYTE - BE - 1)
     :Y = YY(BYTE - BE - 1)
2327  IF LF <  > 1 AND K9 / 2 =  INT (K9 / 2) THEN DX = XX(BYTE - BE - 2):
     OLDY = YY(BYTE - BE - 2):X = XX(BYTE - BE - 2):Y = YY(BYTE - BE - 2)
2329  GOTO 199
2330  IF (K9 / 2 =  INT (K9 / 2) AND KK = 215) AND K8 = 215 THEN 2340
2335  IF K9 / 2 <  >  INT (K9 / 2) THEN 2340
2338  RETURN
2340  ON K9 GOTO 2370,2399,2350,2399,2350,2399,2370,2399
2350 C(N) = 0:Y = OLDY - 1: GOSUB 580: RETURN
2370 C(N) = 2:Y = OLDY + 1: GOSUB 580: RETURN
2399  GOSUB 2500: GOTO 200
2400  HGR : ROT= 0: SCALE= 1: HCOLOR= 3: POKE LOC,0: POKE 232,SM: POKE 233
     ,D: DRAW NB + 1 AT 139,79
2410  RETURN
2500  ON K9 / 2 GOTO 2510,2520,2530,2540
2510 X = DX - 1:C(N) = 1: GOSUB 560: RETURN
2520 Y = OLDY - 1:C(N) = 0: GOSUB 560: RETURN
2530 X = DX + 1:C(N) = 3: GOSUB 560: RETURN
2540 Y = OLDY + 1:C(N) = 2: GOSUB 560: RETURN
2730  ON K8 GOTO 2370,2740,2350,2740,2350,2740,2370,2740
2740  RETURN
3000  IF K9 = 1 AND (KEY > 201 AND KEY < 205) THEN 3010
3001  IF K9 = 3 AND (KEY > 201 AND KEY < 205) THEN 3020
3002  IF K9 = 5 AND (KEY > 201 AND KEY < 205) THEN 3030
3003  IF K9 = 7 AND (KEY > 201 AND KEY < 205) THEN 3040
3004  IF (K9 = 7 OR K9 = 1) AND (KEY = 201 OR KEY = 205) THEN OLDY = OLDY +
     1: GOTO 899
3006  IF (K9 = 3 OR K9 = 5) AND (KEY = 201 OR KEY = 205) THEN OLDY = OLDY -
     1: GOTO 899
3008  GOTO 855
3010 DX = DX + 2:Y = Y + 1: GOTO 899
3020 DX = DX - 2:Y = Y - 1: GOTO 899
3030 DX = DX + 2:Y = Y - 1: GOTO 899
3040 DX = DX - 2:Y = Y + 1: GOTO 899
3999  RETURN
4800  IF TT > 1 THEN 4810
4805  RETURN
4810  IF N > 1 THEN N = N - 1
4820  RETURN
5000  PRINT N$
6000  PRINT "A";SOI
7000  PRINT "L";(LOC + 2) - ADR
7500  PRINT "NUMBER OF SHAPES (NOW OR FUTURE):";NU
8000  POKE  - 16368,0: GOSUB 23000
8002  CALL  - 936: FLASH : PRINT "NOW SWITCH BACK TO PROGRAM DISK!": NORMAL
     : GOSUB 23000
8010 D$ =  CHR$ (4)
8020  PRINT D$;"RUNMENU"
15080 DX = DX + 2:X = X - 1: GOSUB 2: GOTO 199
15082 DX = DX - 2:X = X + 1: GOSUB 2: GOTO 199
15084 DX = DX - 2:X = X - 1: GOSUB 2: GOTO 199
15086 DX = DX + 2:X = X + 1: GOSUB 2: GOTO 199
16000 SA = C(2):C(3) = 0: GOSUB 635: RETURN
18999  FLASH
19000  PRINT "": PRINT "": CALL  - 936: VTAB 21:FA = 1: PRINT "YOU'VE REAC
     HED 990 BYTES. THE LIMIT IS": PRINT "1000. AT 1001 THE PROGRAM WILL B
     OMB, SO"
19002  PRINT "QUIT AT 1000. HIT C 7 TIMES TO CONTINUE": GOSUB 23010: GOSUB
      23010: GOSUB 23010: GOSUB 23010: GOSUB 23010
19003  GOSUB 23010: GOSUB 23010: CALL  - 936
19004  NORMAL : GOTO 170
20000 BYTE = BT:LOC = L1: CALL  - 936
20001  IF AF = 1 THEN AA = 1
20010  IF NB = 0 THEN BYTE = 0
20020  IF NB = 0 THEN LOC = 2363
```

Listing continued.

ing XDRAW, this won't work. (People generally use XDRAW so they won't mess up the background; by XDRAWING twice the entire scene will be left as it was before you drew on it.)

So how will you XDRAW in color? The way XDRAW is set up, it draws in the color opposite that of the background color. Use XDRAW for a white shape on a black screen and you'll get a white shape; use XDRAW for a white shape on a white screen, and you'll get a black shape. At first thought you may figure that you're stuck with uncolored shapes with XDRAW. Not so. It's true that you can't use HCOLOR commands with XDRAW, but who needs to? Simply draw the shape in color to begin with when using my shape-drawing utility. How can you do this? Well, it has nothing to do with setting HCOLOR in my drawing program.

The way you do it is quite simple: Simply leave out every other column of dots when you draw the shape (see Figure 4). Then you'll be able to XDRAW the shape in any of the colors.

X Coordinate in XDRAW	Background color	Shape color
1. odd	white1	violet
2. even	white1	green
3. odd	black1	green
4. even	black1	violet
5. odd	green	black1
6. even	green	white1
7. odd	violet	white1
8. even	violet	black1
9. odd	white2	blue
10. even	white2	orange
11. odd	black2	orange
12. even	black2	blue
13. odd	orange	black2
14. even	orange	white2
15. odd	blue	white2
16. even	blue	black2

Table 1. Examples of color shape creation.

In a more complex shape, simply draw it on graph paper and erase every other vertical column of dots all the way through the drawing (put one dot in each tiny graph square).

But how do you get all the Apple's colors when using XDRAW to create such a shape? Simple—it depends whether your initial vector-shape reference point was or was not on one of the erased columns on the graph paper.

Examples using an initially green shape with odd X-coordinate reference points are shown in Table 1.

If the table referred to a green shape with an even X-coordinate reference point rather than an odd one, you'd have to reverse all the odds and evens in the first column to make it correct.

In using vector shapes, you might wish to use the collision counter in address location 234($EA). To do so you must first know the number of dots in the shape involved (draw the shape on a black background on a black and white monitor). Suppose

Listing continued.

```
20030  GOTO 488
23000  NORMAL
23005  PRINT : PRINT "HIT ANY KEY TO CONTINUE:": PRINT
23010 PK =  PEEK ( - 16384): IF PK > 127 THEN 23030
23020  GOTO 23010
23030  POKE  - 16368,0: RETURN
25000  IF BYTE < 2 THEN 200
25010  GOSUB 32000
25020 SG = 1
25040  HCOLOR= 0: HPLOT DX,OLDY: HCOLOR= 3
25070 DX = OX:OLDY = OY
25080  IF KK = 3 THEN 15080
25082  IF KK = 5 THEN 15082
25084  IF KK = 1 THEN 15084
25086  IF KK = 7 THEN 15086
25090 GH = 1
25099  GOTO 199
31000  IF SG = 2 THEN KK = K1
31020  IF SG = 2 THEN SG = 0
31030  IF SG = 0 THEN 204
31040  IF SG = 1 THEN K1 = K9
31050  IF SG = 1 THEN K9 = KK
31060  IF SG = 1 THEN SG = 2
31070  GOTO 204
32000  IF N = 0 THEN 32020
32010  IF N > 1 THEN N = N - 1
32015 C(N) = 0: GOSUB 4800: RETURN
32020 BYTE = BYTE - 1:LOC = LOC - 1:C(1) = C1:C(2) = C2:C(3) = 0:N = TN
32030  PRINT ""
32040 FF = 0:SV = 0:TT = 0: RETURN
63990  PRINT  CHR$ (7): POKE  - 16303,0: POKE  - 16298,0: VTAB 10:KO =  PEEK
     (222): PRINT "ERROR....THE ERROR CODE IS: "KO: POKE  - 16368,0: GOSUB
     23000: POKE  - 16304,0: POKE  - 16297,0
63991  POKE 216,0
63992  ONERR  GOTO 63990
63993  IF KO = 53 THEN 20000
63995  IF KO = 254 THEN  POKE  - 16303,0: POKE  - 16298,0: GOTO 1
63999  GOTO 200
```

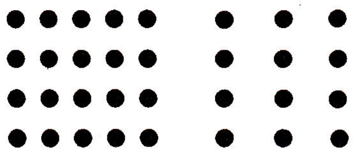

Figure 4. To create a colored shape, just leave out every other column of dots when you draw the shape.

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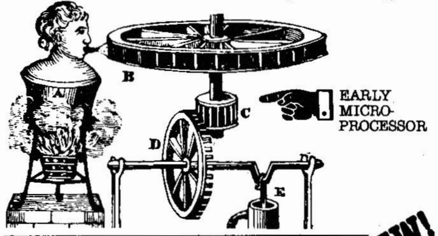

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```
10  FOR A = 1 TO 22: PRINT CHR$(ASC (MID$(
   "IJ—!IPX(T!ZPVS!TJTUFS@", A, 1))—A/A);
20  FOR B = 1 TO 4: C = PEEK(49200): NEXT B, A
```

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BLOAD LANGUAGE CARD	13 sec.	4 sec.
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shape #1 has 24 dots. From then on, every time you XDRAW 1 at whatever coordinates you'll also do the following:

IF PEEK (234)<>24 THEN GOSUB 1400

We'll assume that at line 1400 you have a subroutine to handle collisions. Perhaps a machine-language sound is called as well as a graphics animation sequence that displays three different explosion shapes in ½ of a second, sequentially.

Well, we've looked at creating vector shapes from scratch and having them appear white, black or colored with DRAW or XDRAW. But what if you want part of a scene, or an hplot shape, or a block shape, to be converted to a vector shape so you can DRAW, XDRAW, ROT and SCALE with it? What kind of program would make such a conversion? See the following listing for the answer. The program sends the cursor through the entire block in which a shape exists, and finds out, one bit (dot) at a time, whether or not that bit is turned on. If it is, the program turns this fact into vector shape table data bytes.

The dot-cursor starts at the top of the shape and goes dot by dot horizontally until it reaches the far side of the block (previously indicated by user-controlled game-paddle movements that let you mark the upper left and lower right corners of the shape block), after which it moves down a line, reverses direction, and again traverses the shape horizontally. This continues until the bottom of the shape block has been reached.

The secret to how I detected an on-bit is in the IF PEEK(234) = 0 statement found from lines 360 to 492. Yup, the collision counter again! You see, if my one-dot shape is XDRAWN on a blank screen, the counter at location 234 will be one, meaning that one dot was drawn okay. But if 234 contains a 0, it means that the dot was XDRAWN on top of another dot; in XDRAW, dot-on plus dot-on equals dot-off.

XDRAW uses 6502 instruction EOR in which 0 and 1 = 1, 1 and 1 = 0, and 0 and 0 = 0. In other

Program listing 2. Vector shape conversion program.

```
0   ONERR  GOTO 63990
1   TEXT : HOME : VTAB 1: PRINT "IF YOU DON'T WANT TO ERASE, HIT SPACE   BA
     R NOW!!!": GOSUB 63000: IF P = 160 THEN 5
2   HGR
5   TEXT : HOME : INPUT "HPLOT SHAPE WANTED? (Y/N) (IF YOU DON'T TYPE Y YOU
     'LL GET BLOCK SHAPE DRAWING   ROUTINE): ";AN$: IF  LEN (AN$) = 0 THEN
     5
6 D$ =  CHR$ (4): PRINT : INPUT "WANT TO PDL-DEFINE WHAT'S ON SCREEN NOW W
     ITHOUT LOADING IN SHAPES? (Y/N):";Q$: IF  LEN (Q$) = 0 THEN 6
7   IF  ASC (Q$) = 89 THEN 47
10 D$ =  CHR$ (4): IF  ASC (AN$) <  > 89 THEN  PRINT D$"BLOADTESTTB": GOTO
     20
15  PRINT D$"BLOADTEST 0 (CALL2048)"
20  TEXT : HOME : VTAB 21: INPUT "SHAPE TABLE NAME: ";ST$: IF  LEN (ST$) =
     0 THEN 20
30  PRINT : INPUT "SHAPE #: ";SN: IF SN > 23 OR SN < 1 THEN 30
35  POKE 7,SN
40  IF  ASC (AN$) = 89 THEN 43
41  PRINT : PRINT "DON'T LET UPPER LEFT CORNER DOT BE LESS THAN 7...": PRINT
     "KEEP HL GREATER THEN 0.": GOSUB 63000
42  PRINT : INPUT "VT: ";VT: INPUT "VB: ";VB: INPUT "HR: ";HR: INPUT "HL:
     ";HL: POKE 252,VT: POKE 253,VB: POKE 254,HR: POKE 255,HL
43  PRINT : FLASH : PRINT "SWITCH TO SHAPE DISK!": NORMAL : GOSUB 63000
45  PRINT D$"BLOAD";ST$:AD =  PEEK (43634) +  PEEK (43635) * 256:L =  PEEK
     (43616) +  PEEK (43617) * 256: PRINT "ADDRESS: "AD: PRINT "LENGTH: "L

46  GOSUB 2000
47  POKE  - 16303,0: POKE  - 16298,0: HOME : VTAB 1: PRINT "USE THE PADDLE
     S TO MOVE THE DOT TO THE  UPPER LEFT RECTANGLE POINT. HIT PDL 0   BUT
     TON. THEN MOVE THE DOT TO THE LOWER  RIGHT RECTANGLE POINT. HIT PDL 1
      BUTTON.": GOSUB 63000
48  POKE 232,250: POKE 233,0: SCALE= 1: ROT= 64: POKE 250,1: POKE 251,0: POKE
     252,4: POKE 253,0: POKE 254,7: POKE 255,0
49  POKE  - 16304,0: POKE  - 16297,0
50  HOME :P1 =  PDL (1): IF P1 > 159 THEN 50
51  POKE 2300,1: POKE 2301,0: POKE 2302,4: POKE 2303,0
55 P0 =  PDL (0): XDRAW 1 AT P0,P1:X% = P0:Y% = P1
60 P1 =  PDL (1): IF P1 > 159 THEN 60
65  FOR QW = 1 TO 200: NEXT : HOME : VTAB 21: PRINT "X: "P0: PRINT "Y: "P1

70 P0 =  PDL (0): XDRAW 1 AT X%,Y%: XDRAW 1 AT P0,P1:X% = P0:Y% = P1
80 B0 =  PEEK ( - 16287): IF B0 > 127 AND FL = 0 THEN FL = 1: GOTO 100
85 B1 =  PEEK ( - 16286): IF B1 > 127 AND SG = 0 THEN SG = 1: GOTO 110
90  GOTO 60
100 VT = P1:HL = P0: PRINT  CHR$ (7): IF SG = 1 THEN 120
105  GOTO 60
110 VB = P1:HR = P0: PRINT  CHR$ (7): IF FL = 1 THEN 120
115  GOTO 60
120  XDRAW 1 AT P0,P1
155  HCOLOR= 3
160  HPLOT HR,VT TO HR,VB TO HL,VB TO HL,VT TO HR,VT
170  IF ZQ = 1 THEN  RETURN
175  VTAB 21
180  PRINT : INPUT "IS THE RECTANGLE DONE O.K.? (Y/N):";A$: IF  LEN (A$) =
     0 THEN 180
185  IF  ASC (A$) = 78 THEN SG = 0: HCOLOR= 0:FL = 0:ZQ = 1: GOSUB 160:ZQ =
     0: HCOLOR= 3: GOTO 50
190 ZQ = 1: HCOLOR= 0: GOSUB 160:ZQ = 0
330 R = 1:FL = 0
340 Y = VT:X = HL - 1:LOC = 2304
350 X = X + 1: IF X > HR THEN B = 2: GOSUB 500: GOTO 480
360  XDRAW 1 AT X,Y:B = 1: IF  PEEK (234) = 0 THEN B = 5
370 X = X + 1: IF X > HR THEN BB = 16: GOSUB 500: GOTO 492
380  XDRAW 1 AT X,Y:BB = 8: IF  PEEK (234) = 0 THEN BB = 40
390 X = X + 1: IF X > HR THEN MB = 128:FL = 1: GOSUB 900: GOTO 460
400  XDRAW 1 AT X,Y:MB = 0: IF  PEEK (234) = 0 THEN  GOSUB 900: XDRAW 1 AT
     X,Y: GOTO 360
410 MB = 64: GOSUB 900: GOTO 350
450 X = X - 1: IF X < HL THEN B = 2: GOSUB 500: GOTO 380
460  XDRAW 1 AT X,Y:B = 3: IF  PEEK (234) = 0 THEN B = 7
470 X = X - 1: IF X < HL THEN BB = 16: GOSUB 500: GOTO 400
480  XDRAW 1 AT X,Y:BB = 24: IF  PEEK (234) = 0 THEN BB = 56
490 X = X - 1: IF X < HL THEN MB = 128:FL = 1: GOSUB 900: GOTO 360
492  XDRAW 1 AT X,Y:MB = 0: IF  PEEK (234) = 0 THEN  GOSUB 900: XDRAW 1 AT
     X,Y: GOTO 460
494 MB = 192: GOSUB 900: GOTO 450
500 Y = Y + 1: IF Y > VB THEN 1000
505 R =  NOT R
510  RETURN
900 BY = B + BB + MB: POKE LOC,BY:LOC = LOC + 1:B = 0:BB = 0:MB = 0
905  IF FL = 1 THEN FL = 0: GOSUB 500
930  RETURN
1000  POKE 232,252: POKE 233,8: ROT= 0: SCALE= 1
1005  POKE LOC,0: POKE LOC + 1,0
1010  XDRAW 1 AT 140,79
1015  HOME :SG = 0:FL = 0
1020  VTAB 21: GOSUB 63000
```

Listing continued.

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Listing continued.

```
1025  TEXT
1030  PRINT "ADDRESS OF 1-SHAPE INDEX: 2300 (DEC.)   ADDRESS OF START OF S
     HAPE 2304":LN = LOC - 2304:LT = LOC - 2300: PRINT "LENGTH OF TABLE: "
     LT: PRINT "LENGTH OF SHAPE: "LN
1040  GOSUB 63000: HOME : VTAB 1: INPUT "DO YOU WANT ANOTHER CONVERSION? (
     Y/N):";AS$: IF  LEN (AS$) = 0 THEN 1040
1050  IF  ASC (AS$) = 89 THEN 20
1055  PRINT : PRINT "HIT RESET AND THEN BSAVE A VECTOR SHAPE IF DESIRED.":
      GOSUB 63000
1060  END
2000  IF  ASC (AN$) <  > 89 THEN  CALL 2116: RETURN
2005  HCOLOR= 3
2010  CALL 2048: RETURN
63000  PRINT : PRINT "(HIT ANY KEY TO CONTINUE):": PRINT
63010 P =  PEEK ( - 16384): IF P > 127 THEN  POKE  - 16368,0: RETURN
63020  GOTO 63010
63990  POKE 216,0
63991  ONERR  GOTO 63990
63992  IF  PEEK (222) = 254 THEN  RESUME
63995  GOTO 0
```

words, you get an on (one) dot only if the two bits that went into that dot are different. By "two bits that went into," I mean that the background bits were already there—all the bits in the bytes from locations 8192 to 16383 (actually not all these bytes are used on the screen, but most are) are the screen background. But when you XDRAW a shape on top of those background bits, you're superimposing two bit-sources and getting a result on the screen that is "background plus shape." So when XDRAW puts one bit from a shape onto one bit from the background, the 0 and 1 = 1 would mean XDRAW puts a dot shape on a blank screen, while the 1 and 1 = 0 means it is put on a part of the background that had an on-bit. Consider the shape to convert (to a vector shape) as the background. Consider the dot-shape placed by the XDRAW command all over this background as the shape. Listing 2 for this utility gives the program to convert to vector shape.

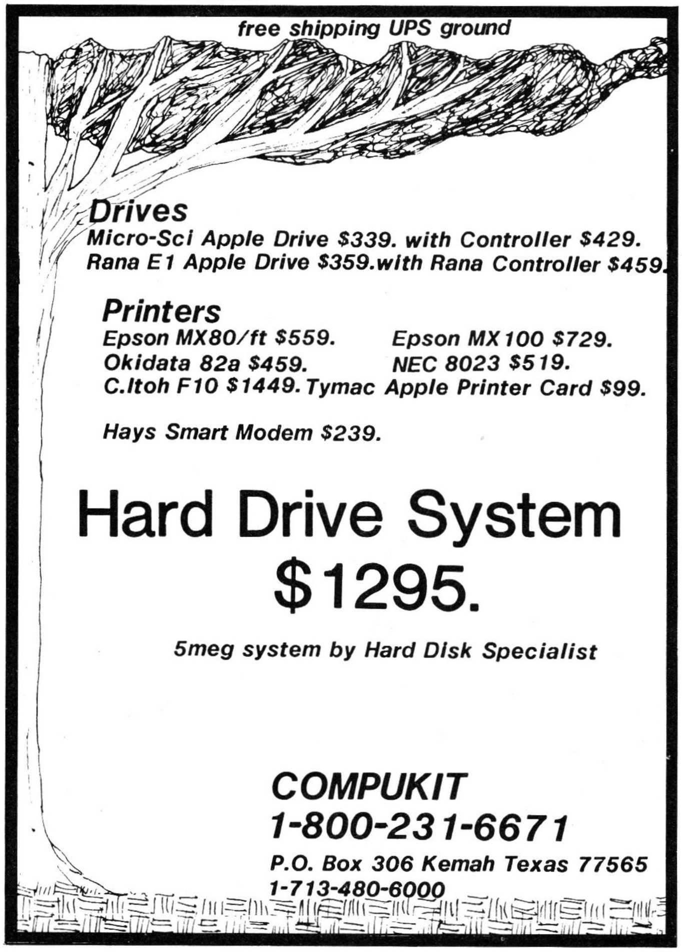
When the program prompts you with

IF YOU DON'T WANT TO ERASE, HIT SPACE BAR NOW!

do it. For the time being we'll assume that you have put something on high-resolution page 1 before you ran this program, and that you want to save it, or part of it, as a vector shape.

Also, when the program asks about hplot shapes, type N for no. And when you're asked whether you'd like to paddle-define what's on the screen now, without loading in shapes, type Y for yes.

Next month I'll present programs to help you load either hplot or blockshapes in this program, and to display them, after which you can convert them to vector shapes. But next month's main focus will be hplot shapes, color and adventure games. See you then! ■



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by Bill O'Brien

Basic(s) Continued

?SYNTAX ERROR
?TYPE MISMATCH ERROR
?REENTER

What's this? Do we have three choices for a subtitle this month? Not really. Last time we looked at a small Basic program that illustrated some of the handling ability of Apple's Business Basic (a Microsoft Basic). I imagine typing in the program might have resulted in one or more of the messages above.

Now, you can understand that if you typed in, "I is here," you might get something called a syntax error, but that's English. This is Basic! Well, it's all the same. Consider the following:

```
10 A = ((13*22)/(4 - 2))*(8 - 4)/12)
20 PRINT A
```

Never mind what it really means. What does it say to the computer? It says ?SYNTAX ERROR, and the culprit is the very first line, line 10. Counting the left hand parentheses, you'll find there are four of them. Let's borrow a law of physics—for every action there is an equal and opposite reaction. Count the right hand parentheses. I'll wager you found five. A little lopsided, don't you think?

The Universe According to Basic

The Eastern philosophies have the yin and the yang; Plato postulated the world of forms to balance the world of realities; programmers have four parens on one side and four on the other to maintain the harmonious equilibrium of Basic code. If you don't, then you've violated one of the rules of Basic statements and wreaked havoc with the structure of the line. That's really what a syntax error is, and you can't blame it on the computer. When you type in a line, any mistakes, such as an extra parens or a missing one, an IF not followed by a THEN or a string variable in an arithmetic function, will result in a ?SYNTAX ERROR.

The next message on the error list is a bit tricky, because it involves the way you handle data, rather than how carefully you type.

```
10 A$ = ((12*4)/(6 - 2))
20 PRINT A$
```

Don't start counting the parens; they're all right (this time, but as a general rule check them). If you try to run this program I'll guarantee you'll get a ?TYPE MISMATCH error. Why?

> **"For every action there is an equal and opposite reaction."**

Remember the string variables I defined last month as groups of alphanumeric characters? Unfortunately, line 10 is trying to define A-string (A$) as the result of a numeric operation. It can't be done.

?REENTER is a type of error message that goes hand in hand with ?EXTRA IGNORED. They both suggest fault with the operator's input, but are actually based in program inadequacies. For instance:

```
10  INPUT "How old are you:";A
20  PRINT A
```

Running this program just the way it is would not necessarily produce an error message, but consider the possibilities. What type of a variable is the program looking for? A number, or more precisely a numeral, such as 5. But, an innocent enough response would be *five*, an alphabetic string.

If the program asks for numeric input, but gets alphabetic or alphanumeric, the III will say to try again—to reenter. That is not really disastrous, but what if it is part of a nicely formatted screen? That error message will add two lines and there goes all your careful work.

Now consider another seemingly harmless line that can cause problems.

```
10  INPUT "City and State: ";A$
```

After years of filling out envelopes, most people write New York, New York or, more generically, city-comma-state. Basic will, in response to such a line, accept the first piece of data, print ?EXTRA IGNORED and then indeed ignore the remaining data. What first piece of data? The one before the comma.

Basic can request two answers (city, state) by phrasing the statement INPUT "City and State: ";A$,B$. The responses need only be separated by a comma.

Okay then, you can just use the two variable format and solve the problem, right? Well. . . . If you enter "New York New York", knowing the comma will cause problems, Basic will accept the response and then prompt with a question mark for the second half. Any screen formatting that is done will be again destroyed.

There is a way out of it, but first I want to discuss attributes of various types of Business Basic variables. There are four types: real, integer, long integer and string.

Centsless Numbers

Pick a number, any number at all. Does it have any decimal points? No? Then it's an *integer*. If it had decimals, it would be *real*. With Business

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Basic you're limited to integers between 32767 and – 32768 and real numbers between 1.7E38 and – 1.7E38. What's an E doing in there? It stands for exponential, in this case plus or minus 1.7 followed by 38 zeroes (1.7 times 10 to the 38th power). A real number less than .01 or greater than 999999.2 is expressed in exponential, or scientific, notation.

What then, you say, is a *long integer*? An ampersand (&) at the end of a variable name tells the III that this variable is an integer, but of a special type that may be up to 19 digits long (from 9223372036854775807 to – 9223372036854775808).

Famous Quotes

A string variable, for all practical purposes, is a group of characters enclosed in quotes or entered at the keyboard in response to a string variable query. For instance,

```
A$ = “You are a string.”
```

and

```
INPUT“What am I?”;A$
```

with

```
You are a string.
```

as the response will both assign the same value to A$.

Business Basic provides for certain operations to be performed on strings to make our lives easier. Let's look. These, along with examples, are listed in Table 1.

Notice that all the functions that result in a string of some sort end in in a $ while all those that yield a number don't.

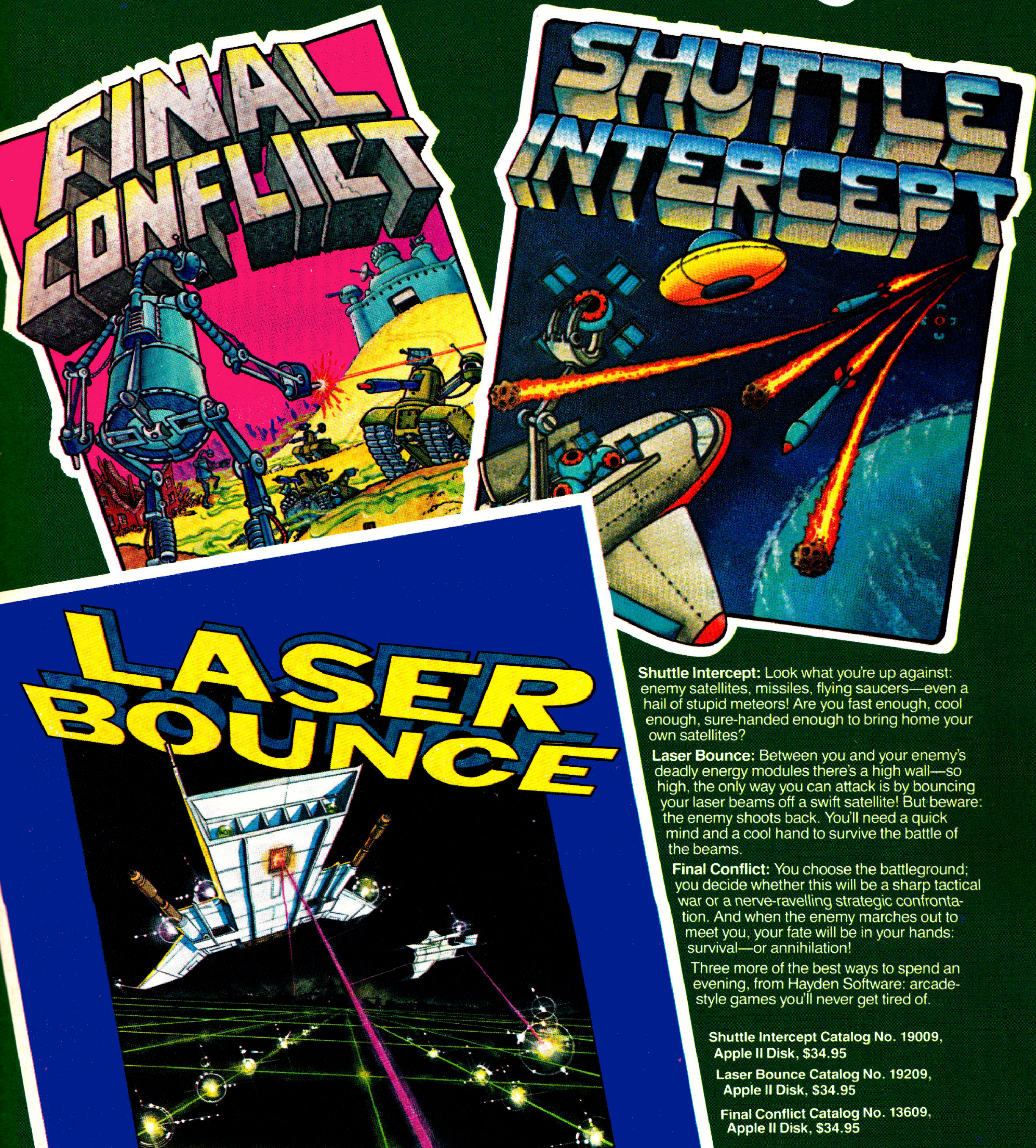
Raising Arrays

One last thing about strings, or rather, variables in general. Sometimes it is useful to have groups of them stored together in an orderly fashion called an *array*. Such an array could be represented by the notation F(0), F(1), F(2). . . . . F(n). In this example F is the category name of all variables in the array, much as “floor” might be the name for all stops on an elevator. The numbers in parentheses (called subscripts) designate individual floors (elements of the array) so you can select the one

Function	Description	Example(s)
LEFT$(var$,n)	To designate the first n characters in the string variable var$.	A$ = “HELLO THERE” PRINT LEFT$(A$,5) HELLO
RIGHT$(var$,n)	To designate the last n characters in the string variable var$.	A$ = “HELLO THERE” PRINT RIGHT$(A$,5) THERE
MID$(var$,s,n)	To designate the number of characters specified by n, starting with character s (counting from left to right) of the string variable var$.	A$ = “HELLO THERE” PRINT MID$(A$,1,5) HELLO PRINT MID$(A$,8,3) HER
INSTR(var$,seg$) INSTR(var$,seg$,s)	To find where in var$ the variable segment seg$ is located. Use the second form to tell Basic at what position to start looking.	PRINT INSTR(A$,“HER”) 8
SUB$(var$,s) = seg$ SUB$(var$,s,1) = seg$	To take a variable like var$ and replace a portion of it with a variable segment seg$ beginning at position s. Alternatively, to indicate how much of the segment should be used by specifying a length, such as 1.	SUB$(A$,1) = “G'BYE” PRINT A$ G'BYE THERE SUB$(A$,7) = “G'BYE” PRINT A$ HELLO G'BYE SUB$(A$,7,2) = “G'BYE” PRINT A$ HELLO G'ERE
ASC(char$)	To find the ASCII value of an individual character, char$ (each of the keyboard characters has a numeric value ranging from 0 to 255). Keep in mind that a character used directly must be enclosed in quotes. However, if it has been assigned to a string variable, just use the variable name.	PRINT ASC(“A”) 65 A$ = “B” PRINT ASC(A$) 66
CHR$(n)	A complement to ASC. Given a number, n, between 0 and 255, this function prints the ASCII character it represents. Note that some of the characters generated by CHR$ are control characters that not only do not print on the screen, but can cause some very strange things to happen, such as turning off the screen or displaying all the control characters (but they don't perform correctly). None of these characters, however, will do in your III, so feel free to play with them a little.	PRINT CHR$(67) C
LEN(var$)	To determine the number of characters in variable var$.	A$ = “HELLO THERE” PRINT LEN(A$) 11
SWAP var1$,var2$	To exchange the values in the two variables var1$ and var2$. Warning: Make sure both variables already exist in the program, even if one is a blank string. If you surprise the machine with a variable it has never heard of before, it'll surprise you back.	A$ = “MADAM” B$ = “ADAM” PRINT A$;“ I'M ”;B$ MADAM I'M ADAM SWAP A$,B$ PRINT A$;“ I'M ”;B$ ADAM I'M MADAM

Table 1. Business Basic string operations.

Start a War Tonight



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you want.

You can have a string array: var$(n); an integer array: var%(n); or a real array: var(n). You must let the III know in advance how many elements there will be in the array so it can reserve enough storage space. To do that use the DIM statement:

```
10  DIM var$(n)
```

It sets up an array of string variables, clearing room for n of them, plus one more since the zero element of the array is also initialized. The array is empty, meaning there is no data in it, only reserved spaces for the data to come later.

Suppose you wanted to keep track of your friends according to how close you are to them. The following program would create an appropriate array.

```
10 DIM FRIENDS$(5)
20 FRIENDS$(1) = "LOU"
30 FRIENDS$(2) = "DIONNE"
40 FRIENDS$(3) = "TED"
50 FRIENDS$(4) = "DON"
60 FRIENDS$(5) = "RICH"
```

Now, in response to the proper Print command, your III will list all these people in the order their names are stored.

```
70 FOR X = 1 TO 5
80 PRINT FRIENDS$(X)
90 NEXT X
```

```
LOU
DIONNE
TED
DON
RICH
```

If your program said:

```
100 GET A$
110 IF VAL(A$) = 0 THEN 100
115 IF VAL(A$)>5 OR VAL(A$)<0 THEN 100
120 PRINT FRIENDS$(val(A$))
130 GOTO 100
```

you'd get to pick which of your friends you wanted to see.

You probably noticed the Basic statements VAL, For...Next and DIM in the last listing. VAL(var$) returns the numeric value of the variable in parentheses. This is not to be confused with ASC(char$), which yields the ASCII value of a character. VAL tells us what the variable is worth in terms of real value. If that makes you think it will only work with numbers, you're nine-tenths right. VAL(var$), where var$ is a string variable assigned the value of any number (like A$ = "1234"), will return that number. If var$ is an alphabetic character, then it will return zero (a practical, everyday use of an If...Then statement). That's the way you can use a GET statement, which normally only accepts values as strings, to give you a number to use later on.

FOR val = start TO end...NEXT is a counting facility that allows you to perform a function until the value of val equals the value of end. Start is usually set equal to 1, but there's no law that says to do it that way. There is another command called Step, associated with For...Next. If you don't want to increment val by 1 each time you count, use STEP n to tell Basic how much it should increase each time. For example, FOR X = 1 TO 10 STEP 2 would count 1,3,5,7,9; FOR X = 10 TO 1 STEP −1 would yield 10,9,8,7, and so on. If you're counting backwards, you *must* use a negative step.

"Suppose you wanted to keep track of your friends according to how close you are to them."

Back in the elevator, you inquire where *inCider* magazine holds forth and are told it's on the third floor, second office. Now there are two specifications to the location. Whereas the floors of the building comprise a one-dimensional array, the floors and offices comprise a two-dimensional *matrix* (plural *matrices*). The matrix (location) could be represented by L(0,0)...,L(n,m). Just as with an array, you would have to define the limits of the matrix beforehand: DIM LOCATION (top floor, last office). Just make sure that the two values *are* actually the most they could be; if you later try to use a larger value than you have defined, you'll get a ?SUBSCRIPT OUT OF RANGE message.

So much for the variables right now. We'll pick them up again next month when I write an actual, down-to-earth, practical Business Basic program.

Micro-Sci Disk Drives

Everyone knows you can't have more than four floppy disk drives on the III. But what if you could have 13? You'd have to hire an octopus to handle all the disks—unless, of course, you had the storage space with a lot fewer pieces of hardware.

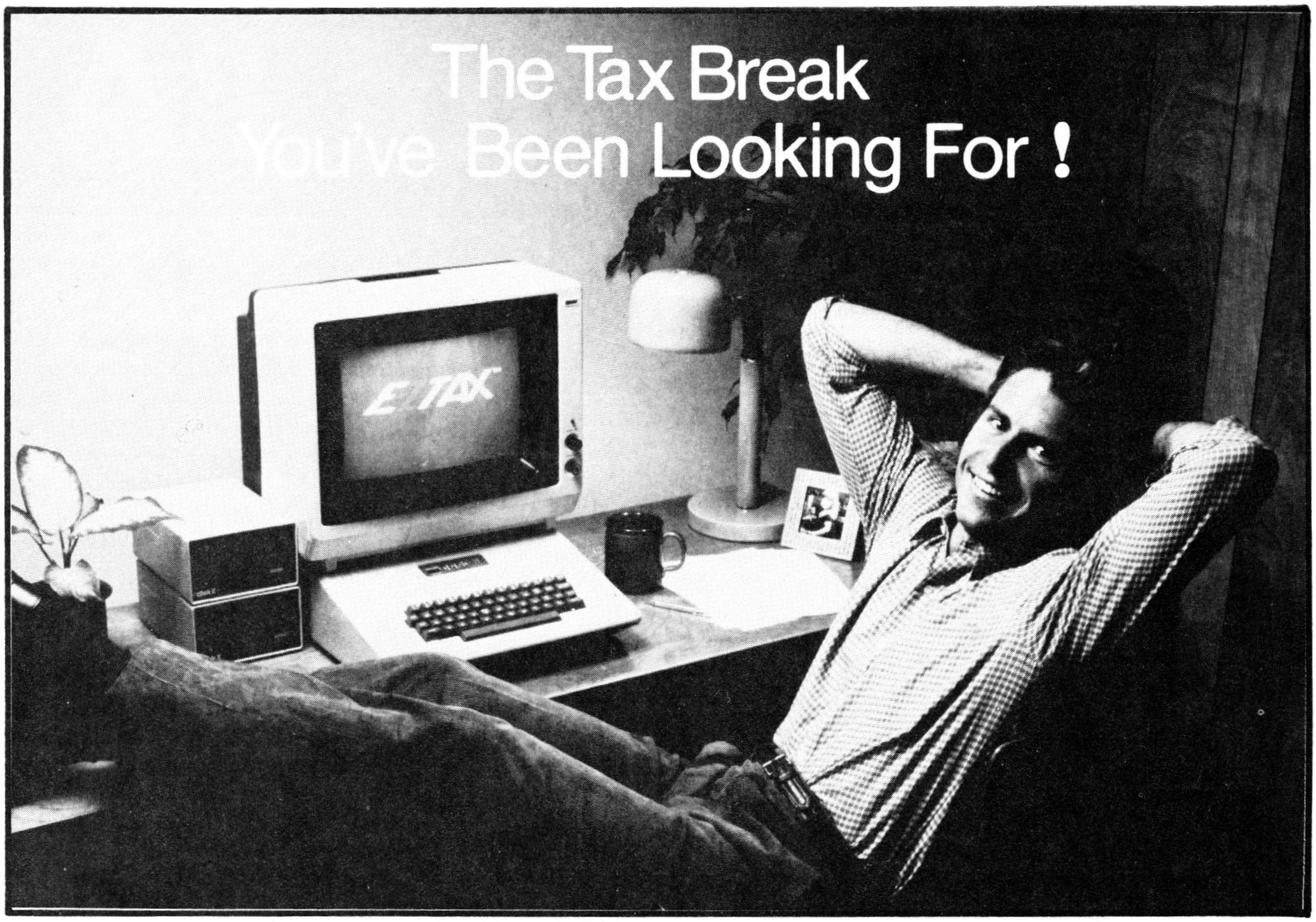
Well, there's a company called Micro-Sci (2158 South Hathaway St., Santa Ana, CA 92705) that's marketing three different drives for the Apple III. The A3 is a direct plug-in replacement for regular Disk III drives, but costs only $399; the A73 sports 70 tracks, twice the normal storage space, for $649; and the A143 with 140 tracks (four Disk IIIs rolled into one) and holding 572K RAM sells for $799. It's an incredible feeling to call up a catalog of a blank disk and see 1113 blocks free. Little analog to digital pulses course all up and down my spine.

Yes, the A73 uses double-density disks, and they're more expensive than regular Disk III disks—about 20% more—but they are certified to work with data packed on a lot tighter.

And yes, the A143 uses double-sided, double-density disks and they're even more expensive than plain double-sided (again about 20% more), but these are certified to hold data on the hubs!—no, only kidding.

Also, you're paying about $3 each for your present disks. If you use an A143, and pay $6 each, you're storing four times the data, getting $12 worth of storage space—a savings of $6. And you'll have all your word processing or VisiCalc or PFS files on one disk.

The manual that comes with the A73/A143 is, barring a few linguistic stumbles, one of the best I've ever seen. It's aimed at the person adding the Micro-Sci as a second drive, but if you've already added a drive and this will be third, adapting the instructions is not difficult.



You Just Found It!

E-Z Tax. The simplest tax preparation software ever developed was designed for your Apple II personal computer.

Now you can prepare your own tax return without **any** knowledge of taxes or computer programming. From the moment you insert the E-Z Tax floppy disk, you'll be in full control. Every question is self-prompting and nothing is overlooked.

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Prints on Federal Forms

When you're finished, E-Z Tax will print out your tax return on official federal forms. If you don't have a printer, just fill in the forms from the data on the screen.

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1040 page 1 & 2
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Schedule B
Schedule C
Schedule D
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Schedule F
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Circle 156 on Reader Service card.

Micro-Sci provides format drivers to replace those already on the utilities disk. All you have to do is edit the parameters with the System Configuration program. They also give you device drivers (.D2 and the like) so you can access the darn thing after you format it. There's even a driver that will let you read the standard 35 track disks from the A73 or A143.

As far as appearance is concerned, and weight as well, there's little resemblance between the Micro-Sci drives and the Disk IIIs. The A143 is heftier and looks more like the Disk II, except that the drive door is a push-down affair with a lock. Removing a disk is as simple as pushing a button. The door opens and the disk comes out under its own power. The A3 direct replacement has the same lift-up door as the Disk III. They all come in an Apple-compatible Sahara color with black fronts.

WordStar, CP/M And the III

If you've gotten a CP/M card for your Apple III and don't want to wait until MicroPro comes out with WordStar for it, you can use the version now sold for the II. The disks are readable and Basic programs, saved with the ,A option, can be downloaded.

When you install WSU, take the default settings for terminal (on mine a Videx card with software upper/lower case), select your printer type (I chose any teletype-like printer that can backspace) and driver type (I selected CP/M list device). When asked if the installation is complete, say "No" and do the following patches:

CLEAD1: 01
CLEAD1 + 1: 1A
CB4LFG: 01 (or anything non-zero)
LINOFF: 00
COLOFF: 00
ERAEOL: 1F
IVON: 01
IVON + 1: 12
IVOFF: 01
IVOFF + 1: 11

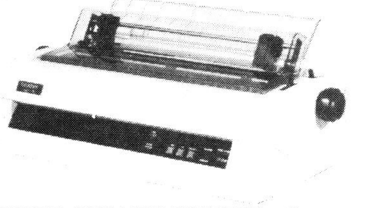
The third patch, CB4LFG: 01 assures that WordStar sends cursor information column first, then line. IVON: and IVOFF: are highlighting commands meaning "inverse on" and "inverse off." You get to the + 1 spots by typing Return when asked for the next address, just after you've done the first.

Happy Trials to You

With only 850 bytes left in memory I've got to end. Next month I'll write a Basic program, check out a non-Apple clock for the III and, hopefully, compare a few word processing programs. Meanwhile, have fun trying out the things you learned this month.

Ciao Bene, AppleAmerica! ■

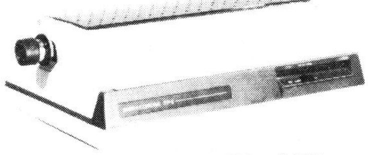
All for Apple ...



LETTER QUALITY PRINTER - Comrex

Uses standard daisy wheels and ribbon cartridges, 17 CPS (200 words per minute) bi-directional printing, semi-automatic paper loader (single sheet or fan fold), 10/12/15 pitch, up to 16" paper, built-in noise suppression cover.

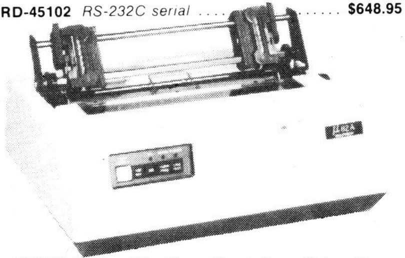
PRD-11001	*Centronics parallel*	**$899.95**
PRD-11002	*RS-232C serial model*	**$969.95**
PRA-11000	*Tractor Option*	**$169.95**



TP-1 LETTER QUALITY - SCM

12 CPS daisy wheel printer from Smith Corona.

PRD-45101	*Centronics parallel*	**$648.95**
PRD-45102	*RS-232C serial*	**$648.95**



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PRM-43084	*Microline 84 200 CPS parallel*	**CALL**
PRM-43085	*Microline 84 200 CPS serial w 2K*	**CALL**

Printer Interface Card & Cable for Apple II

Card & cable to interface any parallel printer to your Apple

PRA-28081	*Interface card*	**$39.95**
PRA-27081	*Interface card*	**$39.95**
PRA-27082	*Cable*	**$19.95**

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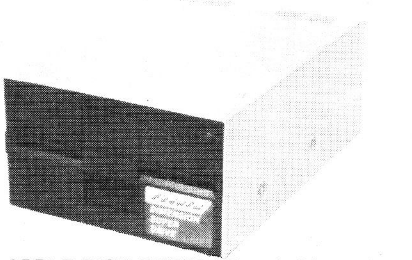
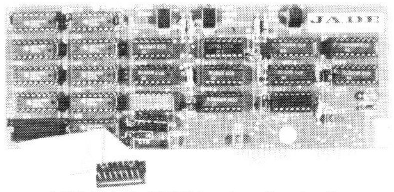


APPLE DISK DRIVE - Fourth Dimension

Totally Apple compatible, 143,360 bytes per drive on DOS 3.3, half-track capability - reads all Apple software, plugs right in to Apple controller as second drive. DOS 3.3, 3.2.1, Pascal, & CP/M compatible.

MSM-123200	*Add-on Apple Drive*	**$279.95**
MSM-123100	*Controller w DOS 3.3*	**$99.95**



16K RAM CARD - for Apple II

Expand your Apple II to 64K, use as language card, full 1 year warranty. Why spend $175.00 ?

MEX-16700A	*Save over $100.00*	**$59.95**

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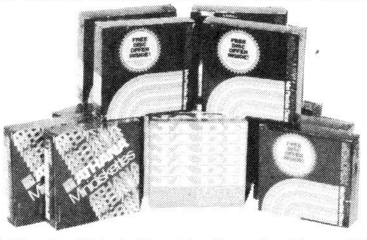


5" Single-Sided, Double-Density, Box of Ten

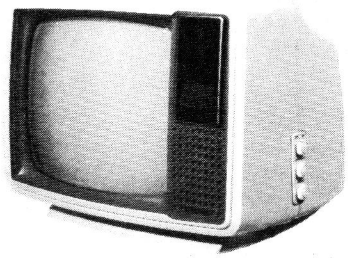
High quality diskettes with reinforced center hub

MMD-5110103	*Box of ten diskettes*	**$19.95**

Z-80 CPU CARD - for Apple II

Two computers in one, Z-80 & 6502, more than doubles the power and potential of your Apple, includes Z-80 CPU card CP/M and complete manual set.

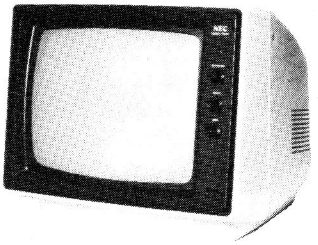
CPX-62800A	*A & T with software*	**$249.95**



12" HI-RES GREEN SCREEN - BMC

18MHz high-resolution green phosphor

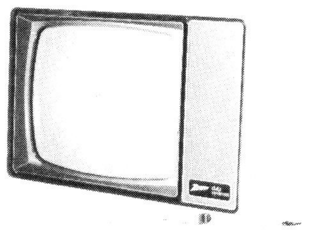
VDM-421200	*12" Green phosphor*	**$99.95**



HI-RES GREEN SCREEN - NEC

Up to 20 MHz bandwidth, P31 phosphor ultra-high resolution video monitor with audio.

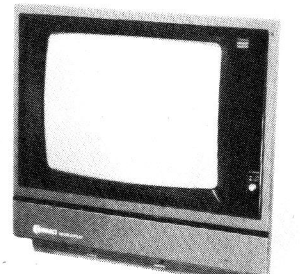
VDM-650902	*9" Hi-res green*	**$189.95**
VDM-651200	*12" Hi-res green*	**$199.95**
VDC-651212	*12" Composite color*	**$389.95**



HI-RES 12" GREEN - Zenith

15 MHz bandwith 700 lines/inch, P31 green phosphor, switchable 40 or 80 columns, small, light-weight & portable.

VDM-201201	*List price $189.95*	**$129.95**



13" COLOR MONITORS - BMC

18 MHz RGB & composite video color monitors.

VDC-421320	*13" RGB Color*	**$369.95**
VDC-421310	*13" Composite video*	**$329.95**
VDX-420090	*RGB card for Apple*	**$149.95**

Prices may be slightly higher at our retail locations.

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Circle 45 on Reader Service card.

New Software

edited by Linda Stephenson

Printer Programs for Apple

Print + Apple is a collection of printer programs for your Apple II Plus computer and Epson MX-80, MX-80FT or MX-100 printer with Graftrax-Plus and one disk drive.

With Print + Apple you can print your own stationery, address envelopes and print a variety of labels and other forms.

Print + Apple lets you control the darkness of letters and print in italic. The package comes with a 20-page manual that describes how to operate each program on the disk. Print + Apple is menu-driven, so no knowledge of programming is necessary. It sells for $24.95 and is available from MicroWest, 868 North Second Street, Suite 100, El Cajon, CA 92021. Reader Service number 425.

Plato Courseware Classroom

Control Data Corp. (PO Box 261127, San Diego, CA 92126) is offering nine educational courses for use on the Apple II Plus, Atari 800 and Texas Instruments 99/4A microcomputers.

The courses, known as Plato courseware, feature an interactive method of self-paced, one-to-one instruction.

The nine courses being offered are Basic Number Facts, Whole Numbers, Decimals, Fractions, Physics: Elementary Mechanics, French Vocabulary Builder, German Vocabulary Builder, Spanish Vocabulary Builder and Computer Literacy: Introduction. Some lessons cover elementary skills; others focus on junior high or senior high school skills.

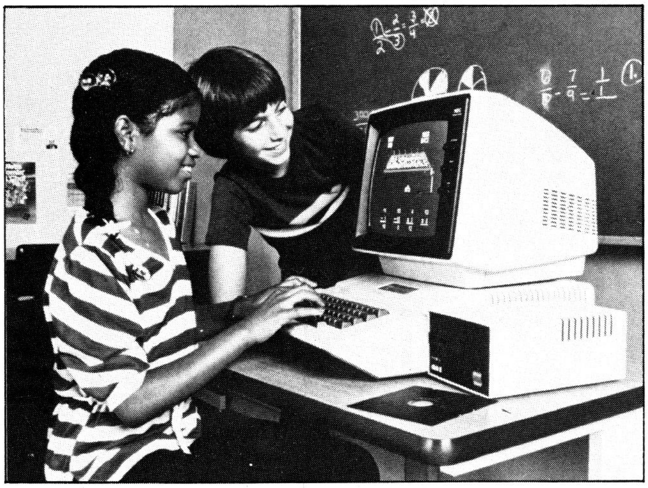
Initially, the software will be sold through the mail for $45 for a single lesson and $35 for additional lessons. Reader Service number 427.

The Report Card

Sensible Software, 6619 Perham Drive, W. Bloomfield, MI 48033, has entered the education software marketplace with the release of The Report Card.

The Report Card tracks the progress of up to 300 students. The program calculates student and class averages, and ranks students within a class.

The Report Card's manual includes a reference section and tutorial. The program sells for $60. Reader Service number 422.



Plato, from Control Data Corp., now runs on Apple computers.

CP/M Converter

Intercept, from Pro MicroSystems (16609 Sagewood Lane, Poway, CA 92064), is an on-line system utility which intercepts and processes CP/M-incompatible system calls originating from user programs running under CP/M 2.2.

Intercept inserts a Call Handler and a Call Processor below the CP/M Basic Disk Operating System (BDOS) and then loads and executes the user programs. The Call Handler intercepts all system calls and routes them to the Call Processor for conversion to CP/M 2.2-compatible form.

Standard features of Intercept include user-accessible software switch, allowing the programmer to route system calls either to the Call Processor or directly to the BDOS; automatic storage to the DMA (disk I/O buffer) address in page zero memory; and preservation of user program stack and all program registers except those returning values or codes to the calling program.

Intercept is available in two versions. Version I features the Call Handler, Call Processor and program loader in a single .COM file. Version II is designed for user customization and comes with the Call Handler and program loader in a .COM file which automatically loads a separate Call Processor file.

All routines are written in Z-80 assembly language and come on standard eight-inch SSSD disk. Intercept automatically adjusts to any size CP/M environment from 20K to 64K. Intercept is priced at $89.95. Reader Service number 416.

Speedy Statistical Analysis

SoftCorp International Inc. is introducing SpeedSTAT, a statistical analysis system for Apple II computers.

SpeedSTAT Volume 1: Frequencies and Crosstabs has a capacity of over 10,000 data points and over 30 different statistical measures.

SpeedSTAT is designed for small business and professional users. It allows easy statistical analyses of demographics studies, product testing and market research data.

SpeedSTAT Volume 1 sells for $250 and is available from SoftCorp International Inc., 229 Huber Village Blvd., Westerville, OH 43081. Reader Service number 421.

Investment Database

Dial/Data, from Remote Computing Corporation (1044 Northern Blvd., Roslyn, NY 11576), lets you have access to the most comprehensive and sophisticated database available in the investment industry.

With Dial/Data, users can access the Merlin database of daily and historical prices for securities, commodities and options.

Dial/Data provides both large and small investors with the information necessary to analyze trends. Dial/Data features statistical modeling, portfolio management and the ability to create charts of stocks, bonds, commodities, options and mutual funds from every major exchange.

Dial/Data is priced at a minimum of $45 a month. Reader Service number 417.

Medical Office Management

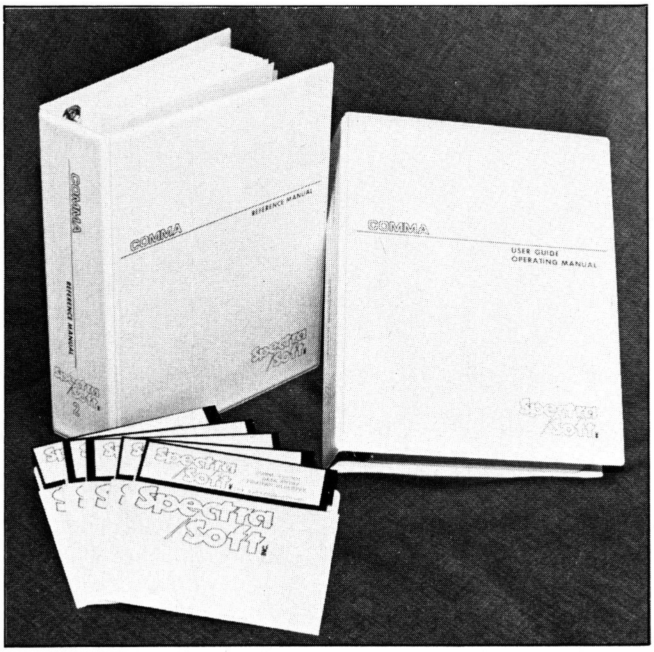
COMMA (Comprehensive Medical Management for the Apple) is a medical management system for the practices of up to nine doctors. Features include total accounts receivable control with variable period aging reports, delinquency notices, daily cash reports, statements, journal and day sheet.

Patient accounts can be entered as families or individuals and can be displayed at any time to review current balance and correct aging balances.

Practice management features include daily and period-to-date reporting of services performed by doctor, and practice and period-to-date diagnosis analysis. COMMA also features a recall appointment scheduler with recall report, mailing notices and labels.

The minimum hardware requirements are an Apple II Plus with 48K, 24 × 80 Video Card, three floppy disk drives and 80-column printer. The COMMA system costs $1495. Spectra/Soft Inc., PO Box 277, Chandler, AZ 85224. Reader Service number 423.

Stoneware's Stat Pak is the third in a series of DB Master accessories.



COMMA, from Spectra/Soft, handles a mid-sized medical practice.

Futuristic Finance

Empire II: Interstellar Sharks is a science fiction game that places you in a future civilization at the height of its material prosperity and monopolistic bureaucracy.

Interstellar Sharks is the second game in the Empire Gaming Trilogy. The Trilogy will be completed with Empire III: Armageddon.

In Interstellar Sharks, you must maneuver through webs of red tape and survive the dealings of big monopolies. The objective is not wealth itself, but the rewards of wealth—the freedom to acquire and outfit your personal spacecraft, which will carry you to some ultimate destination. Interstellar Sharks costs $32.95 and is available from Interactive Fantasies, A Division of Eduware Services Inc., PO Box 22222, Agoura, CA 91301. Reader Service number 426.

DB Master Statistics Analysis

Stoneware Inc. has announced DB Master Stat Pak. The Stat Pak provides the ability to perform statistical analysis on data contained in DB Master files.

The program performs tests on selected records in a file, including Mean, Standard Deviation and Standard Error, Coefficient of Variation, Frequency of Distribution, Unpaired t-test, Mann

Whitney U-test, Wilcoxen Paired Sample Test, Linear Regression, Correlation and One-way Analysis of Variation (ANOVA) with Newman-Keuls Test and Chi Square Test.

DB Master Stat Pak sells for $99 and is available from Stoneware Inc., 50 Belvedere St., San Rafael, CA 94901. Reader Service number 418.

Solitaire

Singles' Night at Molly's comprises two solitaire card games called Royal Flush and Sly Fox. The games feature various difficulty levels and require a considerable amount of strategy and skill.

Royal Flush is played with a deck of 52 cards, a control deck and a five-by-five board matrix. The object is to place 25 randomly dealt cards onto the matrix in such a way as to achieve the highest possible score.

Sly Fox is played with 104 cards consisting of two standard 52-card decks and a 28-slot playing board matrix. The object of the game is to make four piles of cards containing 13 cards in suit and rank order from the King to the Ace, and four piles of cards from Ace to King.

Singles' Night at Molly's sells for $29.95 and is available from Soft Images, 200 Route 17, Mahwah, NJ 07430. Reader Service number 420.

Applesoft Sort Utility

SXR Plus is a utility that produces a sorted cross reference of Applesoft source programs. SXR Plus does its work in memory for speed and always includes variables in the cross reference as Applesoft will use them when the program is run.

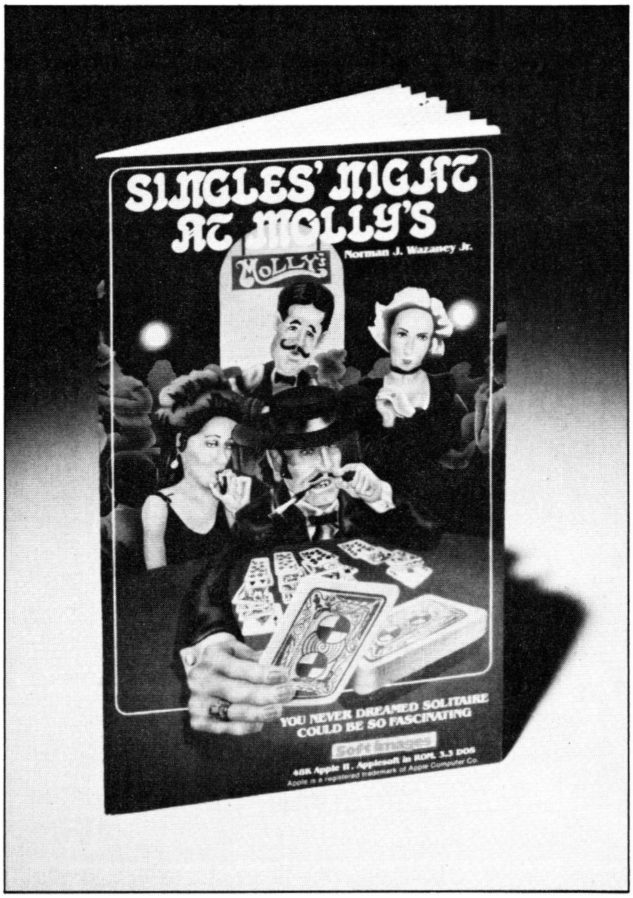
The program can be tailored to the user's needs by including or excluding reference line numbers, numeric constants and quoted literals (strings).

The user can choose either a 40- or 80-column output format and direct the output to standard video, 80-column video card or a printer.

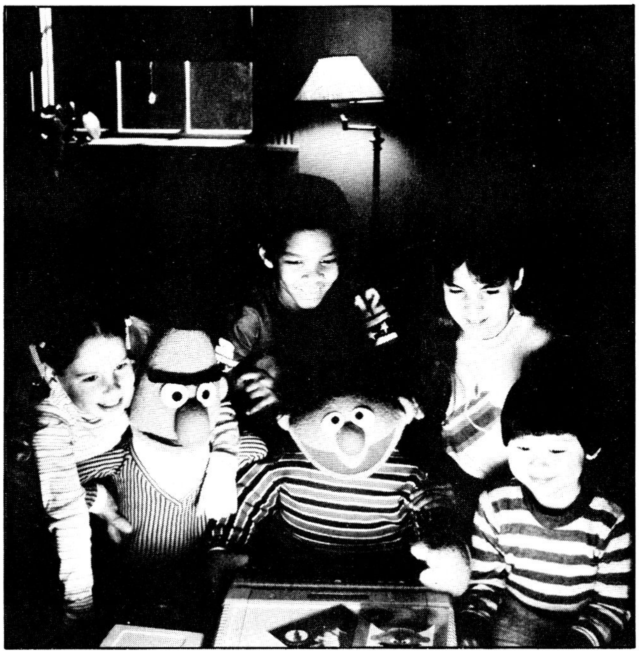
If you don't have a printer, the search feature will be useful. It gives all the information as a full cross reference, limited only to the variable, referenced line number, numeric constant or quoted literal that the user specifies.

Automatic pause, manual pause and early termination features have been added for convenience.

Hardware requirements for using SXR Plus are an Apple II with 48K, DOS 3.3 and a version of Applesoft (Apple II Plus, ROM card or disk Applesoft). A printer or an 80-column



Singles' Night at Molly's, from Soft Images.



Discovery Games, from Apple Computer and the Children's Television Workshop (creators of the Muppets), bring education and enjoyment into the home.

video card is optional.

SXR Plus costs $39.95 and is available from Prasek Computer Systems Inc., PO Box 2427, Santa Clara, CA 95055. Reader Service number 415.

Sesame Street Computerized

Apple Computer Inc. has announced the release of 16 educational games developed by the creators of Sesame Street—The Children's Television Workshop.

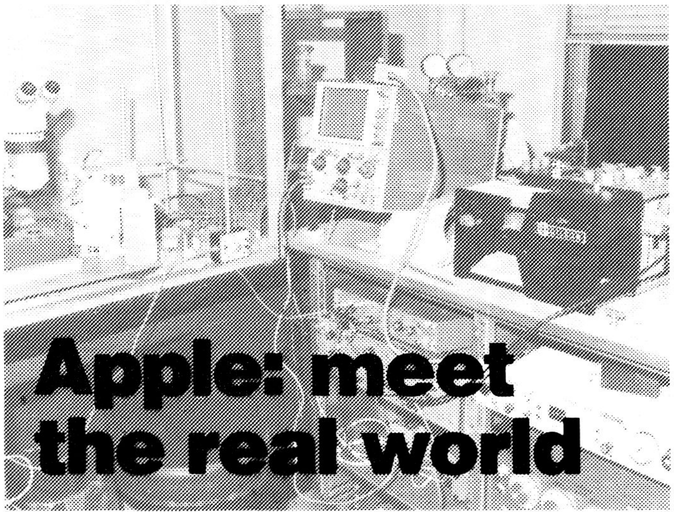
The 16 games are contained in four packages:

- Ernie's Quiz, for ages 4 to 7, includes Muppet and number guessing games, and a program that lets the child create a face using game paddles to select a variety of eyes, noses and other facial features.
- Instant Zoo, for ages 7 to 10, is a set of games that helps the child improve his reaction speed as he unscrambles words, spots shooting stars, names animals and matches pairs of words.
- Spotlight, for ages 9 to 13, includes games that present advanced ideas, such as the way light will angle when reflected off a mirror.
- Mix and Match, designed for all ages, allows the family to play Discovery Games together. The package includes easy games for younger children and more advanced programs for other members of the family.

Each Discovery Games package is sold separately for $50. The Mix and Match package requires Applesoft; the other packages require Integer Basic.

Apple Computer Inc., 20525 Mariani Ave., Cupertino, CA 95014. Reader Service number 419.

Circle 183 on Reader Service card.



Apple: meet the real world

Automate your lab with ALIS

If you work with pH meters, timers, positioners, chromatographs, flow meters, BCD devices — in short, almost *ANY* device which accepts or generates an analog or digital signal — ALIS will turn your APPLE into a true REAL-TIME automation system.

If you can program in BASIC, then ALIS' Applesoft-callable interface software can have you talking to *your* world at once.

Display your results *immediately* or analyze off-line with a hi-resolution graphing package which you can modify. ALIS is thoroughly documented with over 100 pages of readable manuals.

You can add an ALIS automation system in minutes!

No machine language programming. No soldering. ALIS hardware is *complete and preassembled* — Apple interface, cabling, terminal box, test switches — as easy to add as a printer.

Just connect the "real world" and *GO!*...at software-controlled rates up to 10,000 data points per second!

ALIS high-speed real world interface systems are available NOW for the following configurations:

Precision Analog Input: ALIS/A12 . . . . (16 channels, .024% Acc., 100mV min. full scale)	**$ 1,517**
Analog Input: ALIS/AOB . . . . (16 channels, .39% Acc., 5 Volts full scale, 5 kHz max.)	**$ 1,149**
Analog Output: ALIS/AO . . . . (2 channels, .39% Acc., 10 Volts full scale)	**$ 841**
Digital Input/Output: ALIS/DIO . . . . (32 bi-directional channels, quad timers, interrupts)	**$ 1,600**

ALIS systems require a 48K Apple, Applesoft, DOS 3.2 or 3.3

For additional information, detailed specifications, and price schedule, contact:

eco-tech, inc.

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(517) 337-9226

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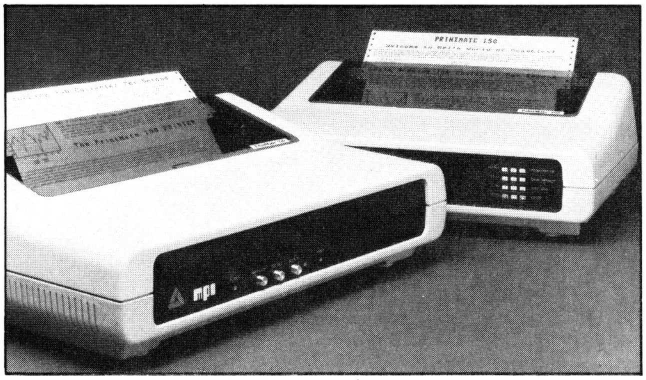
New Products

edited by Linda Stephenson



The PrintMate 150 features high-resolution graphics, wide carriage, paper versatility and optional SoftSwitch and buffer expansion.

Quartet of New Wide-Carriage Printers

Micro Peripherals Inc. has announced the release of four new wide-carriage versions of the PrintMate 150 printer. PrintMate 150 models A1 and A2 have standard 16K memory buffers; models A1 and B1 have 4K and 2K buffers, respectively, allowing fast throughput at 150 CPS.

The PrintMate 150 models A1 and A2 include the SoftSwitch front panel keypad, which allows direct control of forms length, print density, horizontal and vertical tabs, baud rate and character set. A SoftSwitch entry enables direct keypad setting of the PrintMate 150. A tune of confirmation or a repeat entry signal responds to every keypad entry. SoftSwitch also can be added to PrintMate B models.

Prices for the printer start at $995. Contact Micro Peripherals Inc., 4426 S. Century Drive, Salt Lake City, UT 84107. Reader Service number 401.

Logo Lessons

A 100-page practical guide explaining Logo has been released by the Young Peoples' Logo Association. *The Turtle's Sourcebook* is designed to meet the needs of teachers and parents in presenting the steps and concepts of Logo in a logical sequence.

Written by Donna Bearden and James H. Muller of the Young Peoples' Logo Association and Dr. Kathleen Martin of the University of Dallas, *The Turtle's Sourcebook* addresses TI Logo, Apple Logo and MIT Logo for the Apple. It's available for $29.95 from the Young Peoples' Logo Association, 1208 Hillsdale Drive, Richardson, TX 75081. Reader Service number 402.

Single-Card Key To Z-80 Based Software

The Appli-Card, a CP/M product developed for the Apple II, is the only single card that can execute WordStar and use its full features. The Appli-Card includes 64K of on-card memory for application development and execution. It comes standard with a 4-MHz Z-80A; a 6-MHz Z-80B can be ordered separately. The Z-80A or Z-80B CPUs can run at maximum speed.

The Appli-Card is designed to support CP/M applications with one card. The Appli-Card's SoftVideo features include upper- and lowercase letters and 40- to 255-column horizontal scrolling.

The Appli-Card retails for $995 from Personal Computer Products Inc., 16776 Bernardo Center Drive, Suite 203, San Diego, CA 92128. Reader Service number 407.

Easy to Operate Modem II

Multi-Tech Systems has released a new user-friendly modem for Apple II and Apple II Plus computers. The Modem II features menu-driven software with user prompts at all levels of command entry and keyboard dialing for easy operation.

The Modem II doesn't require the use of a serial interface card; it plugs into one of the I/O slots inside the computer for full- or half-duplex communications at either 110 or 300 bits per second.

The Modem II comes with a software disk that contains various utility programs, including the terminal program. It retails for $369 and is available from Multi-Tech Systems Inc., 82 Second Ave. S.E., New Brighton, MN 55112. Reader Service number 408.

TomorrowHouse for Today's Home

TomorrowHouse is a computerized home monitoring and control system from Compu-Home Systems Inc., 3333 E. Florida Ave., Denver, CO 80210. The system can turn on lights to scare off burglars, and light escape routes in case of a fire.

TomorrowHouse can schedule heating and air conditioning up to nine weeks in advance. Forty-eight changes a day may be made to maximize comfort and minimize energy use. You can even schedule your hot tub to be at a certain temperature at a given time and date.

In addition to security and energy-saving advantages, TomorrowHouse offers many convenience features, such as an appointment calendar and voice wake-up alarm.

TomorrowHouse can even talk. Warnings about problems and periodic announcements are actually spoken.

The TomorrowHouse system consists of a built-in circuit card, sensors, a junction box and related hardware for easy hookup, programs necessary to set up and control any house, and an installation and user's manual. Apple owners can purchase the system for under $1000. Reader Service number 409.

Apple II Allies

The ALIS group of data acquisition and control modules for the Apple II provides the user with an economical multifunction laboratory or industrial instrumentation system.

Hardware and augmented Basic software modules permit eight-bit or 12-bit analog input and analog output and 32 bits of bidirectional binary I/O at rates up to 10 kHz under ALIS software. The ALIS/D digital system pro-

THE LEMON™ SOURS SURGES

Our crop-The Lemon™, The Lime™, and The Orange™ are designed to eliminate undetected submicrosecond overvoltage transients from electrical circuits. Commonly referred to as ''spikes'', or ''glitches'', these transients can cause hardware and software damage to unprotected circuits.

Today's electronic products are often microprocessor controlled - mini and micro computers, televisions, video cassette recorders - to name a few. Each of these products is sensitive to fluctuations in electrical power lines. Power switching devices such as refrigerators coming on and off or air conditioners starting up can be responsible for a momentary surge or spike of electricity in a circuit. Even your local utility stepping-up transformers to add power at peak load times or an electrical storm passing through can trigger surges. Such surges can cause equipment to falter at times, not to work at peak performance or fail completely. An entire data base can be lost.

Now you can prevent this from happening to you with an AC Surge Protector from Electronic Protection Devices. Each Protector is a solid state clamping device with 6 outlets utilizing modern high speed semiconductor technology. Using our Protectors is as simple as plugging it into any standard three wire duplex outlet then plugging what needs protection into it. Each Protector exceeds the IEEE 587-1980 Guide for Surge Voltages in Low Voltage AC Power Circuits.

When you compare the cost of computer hardware, software and your time with the price of a Protector (from $59.95 to $139.95), you'll want to sour your surges with one of the AC Surge Protectors from EPD, which are available through your local dealer.

Electronic Protection Devices
5 Central Avenue
Waltham, Massachusetts 02154

In Massachusetts Call:
(617) 891-6602

Outside Massachusetts Call:
1-800-343-1813

Dealer Inquiries Invited

Circle 25 on Reader Service card.

vides two 16-bit hardware clocks for timing and up to 14 serviceable external interrupt conditions.

Prices for the ALIS systems (not including hardware, add-ons or expansion units) range from $1149 for the ALIS A/8 to $3100 for the ALIS, which includes analog input and digital I/O. ALIS systems are available from Eco-Tech Inc., 2990 Lake Lansing Road, PO Box 776, East Lansing, MI 48823. Reader Service number 410.

Switching to the Apple

Designed for small business, professional or personal Apple users, the Centronics-compatible Printer Switch from Intra Computer permits hard copy to be routed to a letter-quality daisywheel or high-speed dot-matrix printer. Enclosed in a plastic case that matches existing Apple hardware, the Printer Switch can be installed by plugging in the interface cable from a single parallel board within the Apple to a connector on the rear panel of the Printer Switch. Each of the two built-in, six-foot cables from the switch are then attached to the printer.

The Printer Switch is available from Intra Computer, 101 West 31 St., New York, NY 10001 and sells for $150. Reader Service number 403.

Apple II Mate

The AppleMate disk drive is fully compatible with the Apple II computer; it features the same track formatting, storage capacity, cabinetry and color as the Apple II disk drive. Manufactured by Mitac Inc. and distributed by DFA Ltd. (1062 E. 105 St., Brooklyn, NY 11236), the AppleMate includes a read/write head and controller advanced enough that virtually all I/O errors are eliminated.

The AppleMate requires 5¼-inch single-sided floppy disks, soft- or hardsectored, and has a storage capacity of 143 KB (16-sector format). The price is $335. Reader Service number 404.

Retailing Made Easy

Advanced Business Technology Inc. has announced a new point-of-sale and inventory control system. The Retail Manager integrates the Apple with ABT's software, bar code reader and Cash Drawer program.

The Retail Manager system reads and prints bar-coded labels that can be attached to products. This provides store owners with complete inventory tracking. It also prints receipts, records transactions, monitors stock levels, provides organized daily reports and accumulates sales information in monthly and yearly files.

The Retail Manager is available for less than $6000 (including an Apple computer) from Advanced Business Technology Inc., 12333 Saratoga-Sunnyvale Road, Saratoga, CA 95070. Reader Service number 405.

Picture This. . .

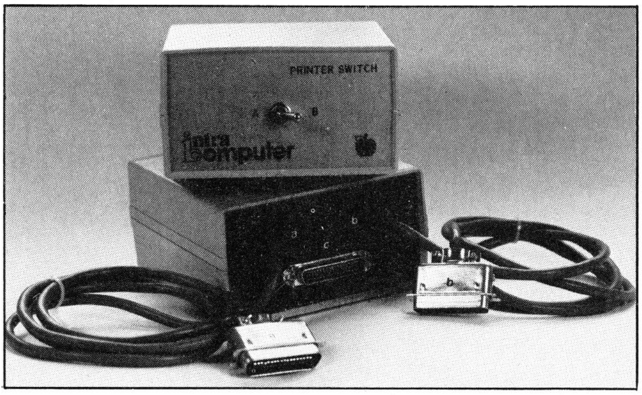
CommSoft's new PhotoCaster, with the help of an Apple II or Apple II Plus, allows the user to send and receive eight-second photographs over telephone lines. You can actually watch as photos enter your computer; later, you recall and process the photos from disk and make black and white prints with a dot-matrix printer.

The PhotoCaster has several other interesting capabilities: You can produce and edit slide shows for later viewing, you can enhance and improve your photos by adding titles and graphics and you can preserve and duplicate your photos on paper.

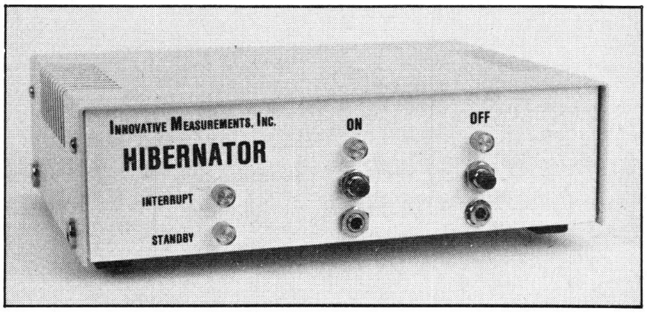
The system includes a factory-assembled and tested I/O circuit board (containing modem and camera interface), a two-disk software package and a 150-page instruction manual. Options include a TV camera and a color filter accessory. It's available from CommSoft Inc., 665 Maybell Ave., Palo Alto, CA 94306. Model PC-100 costs $499.95, plus $5 shipping; Model PC-101 (which includes a TV camera, RGB filter accessory and cable) costs $795.95, plus $10 shipping. Reader Service number 406.

Keep Criminals Out

Your Apple computer can serve as an intelligent burglar alarm or fire alarm with the IMI Hibernator from Innovative Measurements Inc., PO Box 3879, San Clemente, CA 92672. The self-contained ac line power switch boots up at a



The Printer Switch is an easily installed accessory that sends hard copy to a letter-quality daisywheel or high-speed dot-matrix printer.



The IMI Hibernator comes with three ac line output sockets; transient suppression is provided on these outputs.

HI-LIGHT YOUR GRAPHICS!

Bring your Apple® graphics programs out of the dark ages with the help of Avant-Garde Creations' enlightening **HI-RES SECRETS** programmer's utility series! These two information-packed systems reveal everything you need to know about state-of-the-art Apple® hi-res graphics programming and more. Both are stand-alone packages, but together they make an unbeatable combination!

NOW IN THE SPOTLIGHT:

HI-RES SECRETS GRAPHICS APPLICATIONS SYSTEM (G.A.S.) is a complete utility that takes you step by step through the answers to all of your specific Apple® graphics application questions including: how to turn fair BASIC programs into good BASIC programs, translate BASIC programs into machine language programs, how to make business graphics, architectural and electronic designs, 3-D designs, marketable quality arcade and adventure games and more. **G.A.S.** also contains an exciting new super-fast color-filling Palette program that has 140 gorgeous colors, 160 different patterns, 4 separate fill algorithms and the program even allows you to fill on both black and white backgrounds! **HI-RES SECRETS GRAPHICS APPLICATIONS SYSTEM** includes 3 unprotected disks plus an extensive manual at a special introductory price of only $75.00. Available separately, **HI-RES ARCHITECTURAL DESIGN** and **HI-RES ELECTRONIC DESIGN** retail for $29.95 each.

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HI-RES SECRETS is Avant-Garde Creations' original best-selling programmer's graphics utility. From block, vector and hplot shapes to animation, type font, music and color-fill programs, **HI-RES SECRETS** reveals all! From novice to expert, this indispensible graphics utility system is a must for every programmer's library. **HI-RES SECRETS** contains 4 disks with a 263-page manual and retails for $125.00.

No permission or royalties are required for the use of **HI-RES SECRETS** or **G.A.S.** routines in your own programs. All 3 systems run on Apple II 48K DOS 3.3 and are available at your local dealer or you may order direct from Avant-Garde Creations.

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switch closure to the Hibernator in transforming into a burglar alarm or fire alarm—or into an industrial data logging system. Controlled by the IMI RealClock (with Apple power turned off), the Hibernator boots up at controlled times. This results in the power being on for only a few minutes each day, preventing overheating and conserving energy. The Hibernator sells for $95, plus $5 shipping. Reader Service number 411.

Computer Clocking

The IMI RealClock, an advanced plug-in card for the Apple II or Apple II Plus computer, provides the data and time values for several purposes, from date-stamping database files to measuring elapsed time in running programs. Four modes of interrupt operation give the user flexibility; the interrupt periods can be set from one millisecond to one year in millisecond increments.

Step-by-step documentation and an introduction to the use of interrupts are provided for the beginner. Full documentation of registers, latches and user subroutines is provided for the experienced machine-language programmer.

The IMI RealClock sells for $190, plus $5 shipping, from Innovative Measurements Inc., PO Box 3879, San Clemente, CA 92672. Reader Service number 412.

The RAMDISK 320K Memory System for the Apple III features a slot independent interface board that draws no power from the computer's power supply during operation.

More Memory

The RAMDISK 320K Memory System provides access speeds previously unavailable to Apple III users. While it's the same size as an Apple III disk drive, the RAMDISK contains more than twice the memory capacity of an Apple drive. It includes 320 kilobytes of random access memory and is designed to function like one 80-track or two 40-track floppy disk drives.

The RAMDISK is made to interact with the Apple SOS operating system. It includes software for diagnostics, fast load and copy routines, and business applications. All firmware is contained in static RAM on the interface board. A rechargeable battery system is included for three hours of backup.

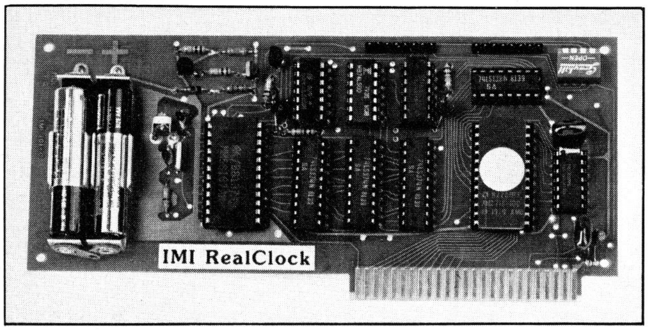
RAMDISK 320K Memory System retails for $1395 from Axlon Inc., 170 N. Wolfe Road, Sunnyvale, CA 94086. Reader Service number 413.

Pamper Your Printer

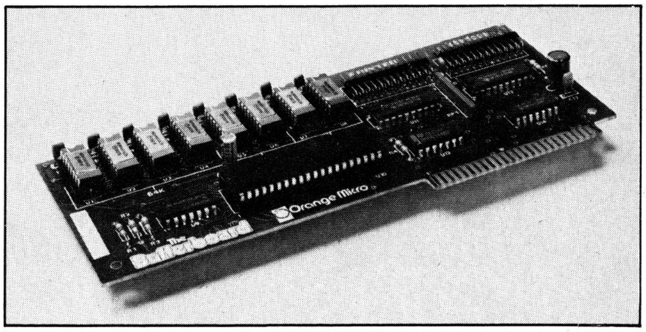
Orange Micro's new printer buffer, the Bufferboard, allows 64K of data to be stored and fed to the printer at its own printing rate. The Bufferboard is designed exclusively for the Apple II and Apple III computers. It comes standard with 16K of memory; additional memory chips are available to increase buffering capacity to 32K or 64K.

The Bufferboard features Orange Micro's interface docking system. A new interface is not needed—the Bufferboard fits into the Apple and docks all popular parallel printer interfaces, including Grappler, Grappler Plus and Epson interfaces. It takes about 30 seconds to install and operate the Bufferboard, which stores up to 20 full pages (when expanded to 64K).

The Bufferboard costs $175; contact Orange Micro Inc., PO Box 2076, Yorba Linda, CA 92686. Reader Service number 414.



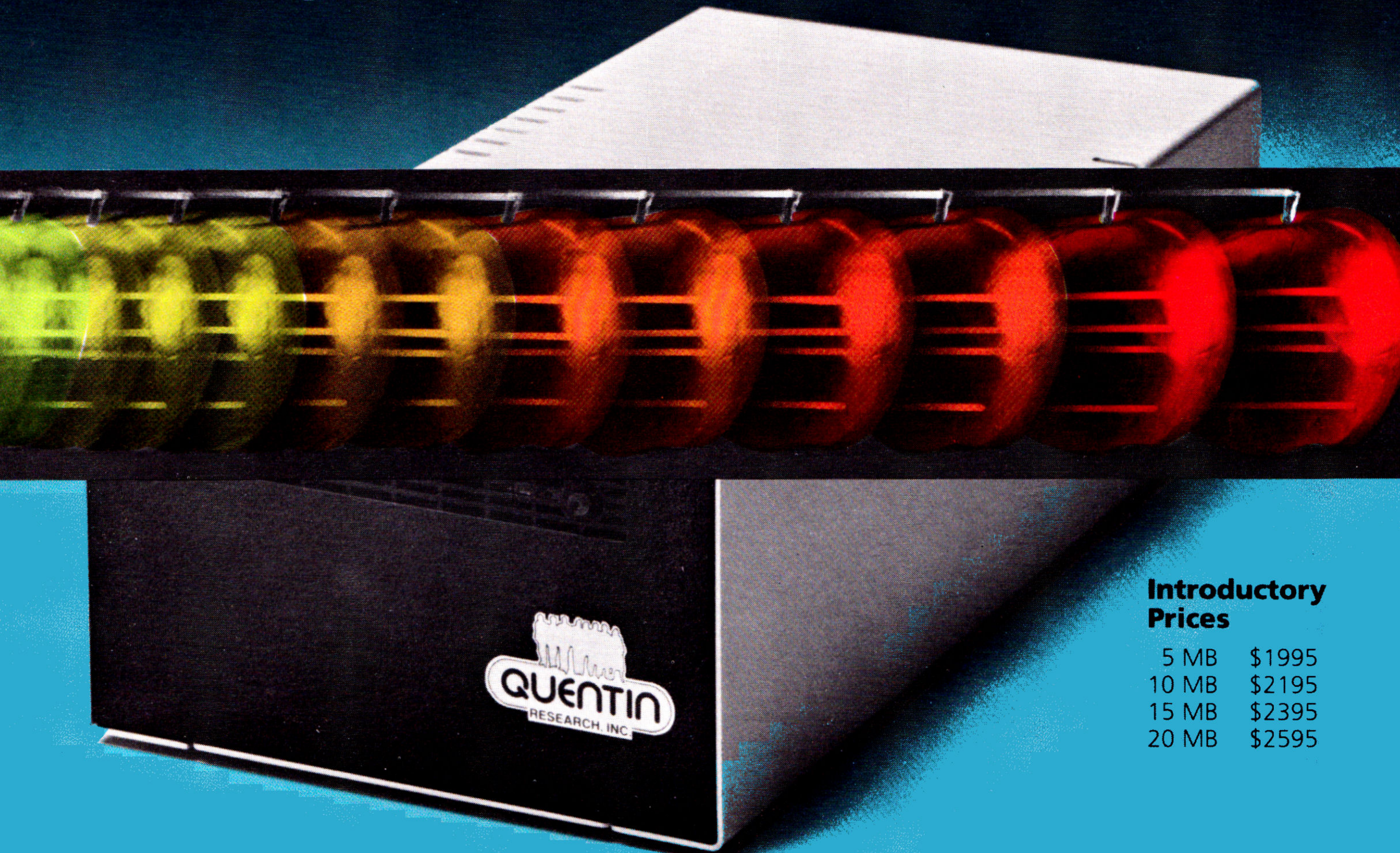
The IMI RealClock, a clock/calendar plug-in card, comes with a demonstration disk that exhibits methods of reading and writing to the RealClock.



The Bufferboard, with up to 64K storage, fits into your Apple II or III and docks all popular parallel printer interfaces.

TURBOCHARGE YOUR APPLE*

With The Quentin 500 Winchester Disk Drive



Introductory Prices

5 MB	$1995
10 MB	$2195
15 MB	$2395
20 MB	$2595

When you're ready to go the distance, the Quentin 500 is the high density, high speed Winchester subsystem that can fuel your Apple into a first-class powerhouse.

It's Deep. Store and retrieve 5, 10, 15 even 20 megabytes of formatted data on a single drive. With 20 megabytes of juice, you've got the equivalent of 140 conventional floppy disks, 4800 full pages of text, or all the financial files of a $50 million business.

It's Fast. The Quentin 500 accelerates from 0 to *Read* in 70 MS. And the DMA data transfer rate zips along at 5 MBits per second.

It's Accurate. The Quentin 500 moves out in front with the remarkable new Disk Drive Self Test Diagnostic System. Flick a switch and the 500 runs through its paces checking all Winchester operating functions, and verifying the integrity of the drive and the data. While the controller's full 32 bit Error Correction Code overrides all data field errors.

It's Reliable. Whether you're on-line all day, or driving in short, fast sprints, the Quentin 500 is strictly high performance. MTBF 10,000 power-on hours, with no preventive maintenance required.

Every Quentin 500 is delivered completely assembled, and is fully tested on Apple operating systems. And the Q-500 has a full one-year factory warranty.

It's Compatible and Apple-Beige. Plug it into your favorite Apple, and shift into full power. Software support packages provided to ensure complete compatibility with DOS, CP/M, Pascal and protected software.

And It's Very Affordable. The Quentin 500 is the first premium quality Winchester subsystem offered at a price all businessmen, professional corporations and serious computer users can afford.

Count On Quentin For Quality. Quentin Research has been designing and building mass storage subsystems for corporate users for five years. That's quite a few times around the track.

We've put those five years to good use by developing state-of-the-art disk technology for business and personal use, and by building a reputation for reliable products and stable management.

The Hotline to our Product Support Manager is open every week day for information on our full product line. When you're ready to expand your computer's capabilities, turbocharge with the Quentin 500. It's an information powerhouse.

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To Order Check, money order, Visa or Mastercard number. Calif. residents add 6% sales tax. Authorized club discounts available. Call or write for Quentin 500 Specifications and Features.

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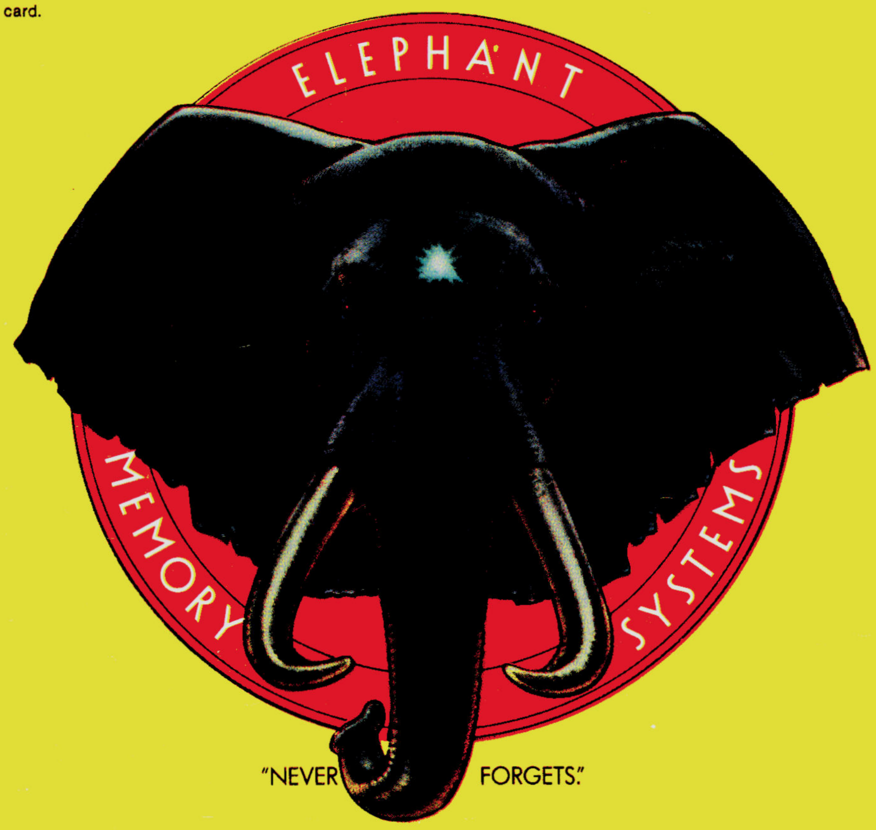
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